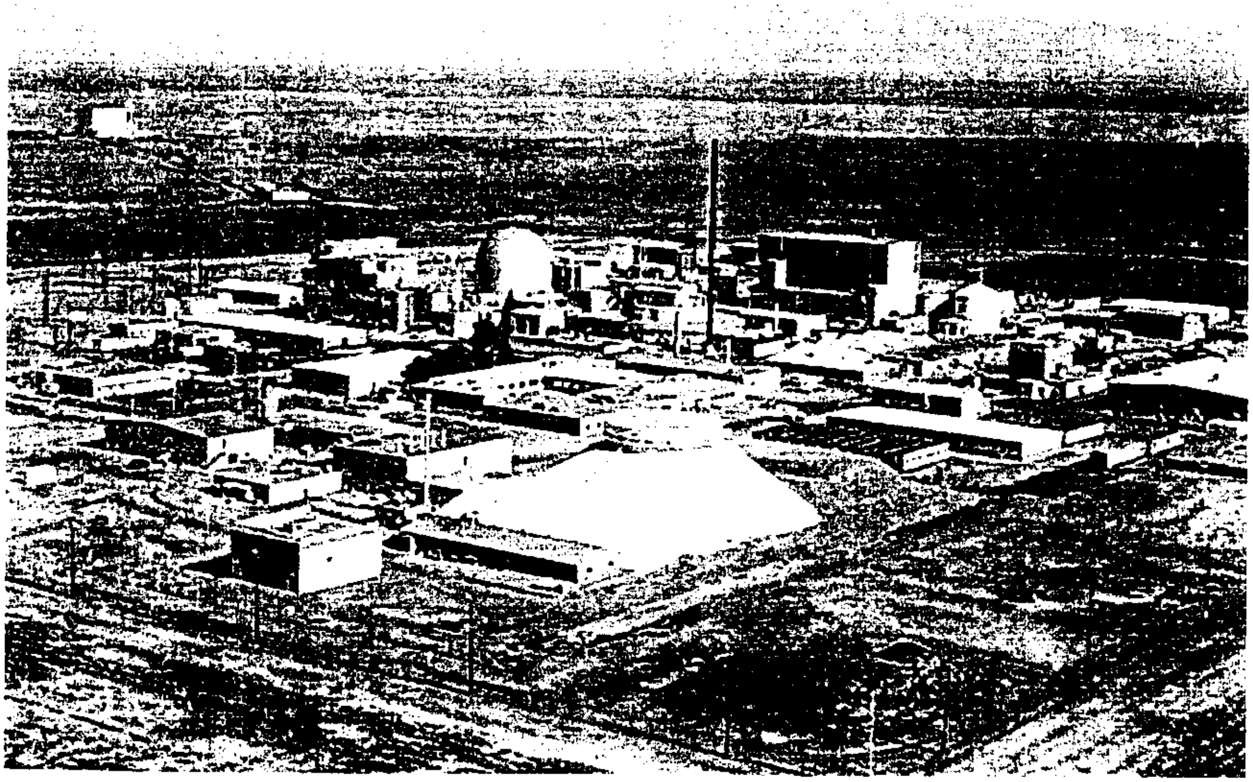
INEEL
IDAHO NATIONAL ENGINEERING & ENVIRONMENTAL LABORATORY

IDAHO DEPARTMENT OF HEALTH AND WELFARE

DIVISION OF ENVIRONMENTAL QUALITY

Final Record of Decision

Argonne National Laboratory - West



Operable Unit 9-04
Idaho National Engineering and Environmental Laboratory
Idaho Falls, Idaho

Final Record of Decision
Argonne National Laboratory - West

September 29, 1998

Prepared by:

The Department of Energy
The Idaho Department of Health and Welfare-Division of Environmental Quality
and
the Environmental Protection Agency-Region 10

Operable Unit 9-04
Idaho National Engineering and Environmental Laboratory
Idaho Falls, Idaho

DECLARATION OF THE RECORD OF DECISION

Site Name and Location

Argonne National Laboratory - West, Waste Area Group 9
Operable Unit 9-04
Idaho National Engineering and Environmental Laboratory
Idaho Falls, Idaho

Statement of Basis and Purpose

The Argonne National Laboratory - West (ANL-W) Waste Area Group 9 (WAG 9) is one of the ten Idaho National Engineering and Environmental Laboratory (INEEL) WAGs identified in the Federal Facility Agreement and Consent Order (FFA/CO). The FFA/CO was signed by the U.S. Environmental Protection Agency (EPA) Region 10, the Idaho Department of Health and Welfare (IDHW), and the U.S. Department of Energy (DOE). Operable Unit (OU) 9-04 is listed as the "WAG 9 Comprehensive Remedial Investigation (RI)/Feasibility Study (FS)", in the FFA/CO. The RI/FS task was to assemble the investigations previously conducted for WAG 9, to thoroughly investigate the sites not previously evaluated, and to determine the overall risk posed by the WAG. This resulting comprehensive Record of Decision (ROD) document identifies eight areas for remedial action and an additional 33 release areas for "No Action" based on the risk to human health and the environment. The remedial actions have been chosen in accordance with the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), of 1986, as amended by the Superfund Amendments and Reauthorization Act, and to the extent practical with the National Oil and Hazardous Substances Pollution Contingency Plan. It is also designed to satisfy the requirements of the FFA/CO. This decision is based on information contained in the Administrative Record for the investigation for the ANL-W facility (WAG 9).

The DOE is the lead agency for this decision. The EPA and IDHW have participated in the evaluation of the alternatives. The EPA and IDHW both concur with the selected and contingent remedy for the clean-up of the eight ANL-W areas of concern and with the No Action determinations for the 33 remaining areas.

Assessment of the Site

Eight areas at ANL-W have actual or threatened releases of hazardous substances, which, if not addressed by implementing the response action selected in this ROD, may present an imminent and substantial endangerment to human health or the environment. These eight areas include the; Sanitary Sewage Lagoons (ANL-04), Industrial Waste Pond, Ditches A, Ditch B, (all from ANL-01), Main Cooling Tower Blowdown Ditch (ANL-01A), Interceptor Canal-Canal and-Mound (sub-portions of ANL-09), and the Industrial Waste Lift Station Discharge Ditch (ANL-35). The response actions selected in this ROD are designed to reduce the potential threats to human health and the environment to acceptable levels. The remaining 33 areas were determined to have acceptable risk to human health or the environment, and therefore require no action.

Description of the Remedial Action Objectives

The Remedial Action Objectives (RAOs) are based on those specified in the National Contingency Plan. For the ANL-W site, the RAO for human health is to prevent direct exposure to radionuclide contaminants of concern (COCs) that would result in a total excess cancer risk of greater than 1 in 10,000 (1E-04) to current and future workers and future residents. The RAOs for the protection of the environment is to prevent exposure to COCs in soils which may have potential adverse effects to resident populations of flora and fauna, as determined by a Hazard Quotient (HQ) = 10 times the HQ calculated from INEEL background soil concentrations.

To meet these RAOs, the risk-based calculation of the concentrations that meet these RAOs were calculated. These concentrations are called the remediation goals (RGs) and establish the quantitative cleanup levels for the contaminated sites. The RGs for the cesium-137 for human health was determined by using a calculation of the concentration needed to produce a risk of 1E-04 for a future resident 100 years from now. As shown in Table A-1, the RG for the cesium-137 is 23.3 pCi/g for the three sites with unacceptable human health risks (the Interceptor Canal-Canal, the Interceptor Canal-Mound, and the Industrial Waste Pond). Likewise, the RGs for the ecological receptors were also risk determined by back calculating the concentrations which cause a hazard quotient equal to 10 times the hazard quotient caused by INEEL natural background soil concentrations. The RGs for the six sites that will undergo remediation for the ecological receptors are shown in Table A-1.

Table A-1. Final Remediation Goals for the WAG 9 Sites.

Receptor	Site	Contaminant	95% UCL Concentration[1]	RG* Concentration[1]
Human Health	Interceptor Canal-Mound (ANL-09)	cesium-137	30.53	23.3
Human Health	Interceptor Canal-Canal (ANL-09)	cesium-137	18	23.3
Human Health	Industrial Waste Pond (ANL-01)	cesium-137	29.2	23.3
Ecological	Industrial Waste Pond (ANL-01)	chromium III	1,030	500
Ecological	Industrial Waste Pond (ANL-01)	mercury	2.62	0.74
Ecological	Industrial Waste Pond (ANL-01)	selenium	8.41	3.4
Ecological	Industrial Waste Pond (ANL-01)	zinc	5,012	2,200
Ecological	Ditch A (ANL-01)	mercury	3.94	0.74
Ecological	Ditch B (ANL-01)	chromium III	1,306	500
Ecological	Ditch B (ANL-01)	zinc	3,020	2,200
Ecological	Main Cooling Tower Blowdown Ditch (ANL-01A)	chromium III	709	500
Ecological	Main Cooling Tower Blowdown Ditch (ANL-01A)	mercury	8.83	0.74
Ecological	Sewage Lagoons (ANL-04)	mercury	3.2	0.74
Ecological	Industrial Lift Station Discharge Ditch (ANL-35)	silver	352	112

[1] - Concentrations in mg/kg or pCi/g
* - Backward calculated risk-based concentration at the 1E+04 level for humans and ten times background for ecological receptors.

Description of the Selected Remedy

The selected remedy for these sites; Industrial Waste Pond and associated Ditches (ANL-01), Main Cooling Tower Blowdown Ditch (ANL-01A), Sanitary Sewage Lagoons (ANL-04), Interceptor Canal (ANL-09), and the Industrial Waste Lift Station Discharge Ditch (ANL-35) is phytoremediation. Phytoremediation is the generic term for "phytoextraction" an innovative/emerging technology that utilizes plants to extract the contaminants from the soil. Phytoremediation would be conducted insitu to remove the metals and the radionuclides from the soils via normal uptake mechanisms of the plants. The plant vegetation is then harvested, sampled, and shipped to an incinerator on the INEEL for volume reduction. The resultant ash will then be sampled and sent to a permitted disposal facility. Phytoremediation would not be initiated on the Sanitary Sewage Lagoons (ANL-04) until approximately 2033 when the ANL-W facility is scheduled for closure. The start of the phytoremediation for the Industrial Waste Pond (ANL-01) will not be initiated until the cooling water discharges from the sodium processing facility are completed. The final sodium cooling water discharges are planned for 2002. This delay in phytoremediation startup for either site dose not pose any increase in the risks to human health and or the environment.

The effectiveness and technical implementability of phytoremediation are very site-specific. DOE estimates that five growing seasons would be required to meet the established Remedial Action Objectives. This estimate assumes natural decay of the cesium-137 along with five percent uptake by the plants. Sample results of the ANL-W sites show the contaminants are predominantly bound in the upper foot of soils. Thus, most of the contaminants are already within the plant root zone and no major movement of soil is necessary. The plants would require additional irrigation and soil amendments. The plant stalks along with the wetted soil condition would help control the spread of windblown contaminants. DOE has conducted a bench-scale testing of soils in 1998 to determine applicability of this remedial alternative. DOE has tested native and non-native INEEL plant species for their applicability for phytoremediation. Where non-native plant species are planted, the plants will be harvested before they go to seed.

It is anticipated that phytoremediation will remove contaminants to acceptable levels after five field seasons. These acceptable levels are defined by the Remedial Action Objectives (RAOs) for the contaminated soils at ANL-W. Phytoremediation will eliminate the need for long-term monitoring and maintenance activities, surface water diversions, land use and access restrictions after 100 years, and long term environmental monitoring (air, sediment, and groundwater). The major components of the selected remedy for ANL-W are:

- Completion of phytoremediation workplan for the field-scale testing
- Conducting a field-scale phytoremediation test of selected plant species at the sites that pose unacceptable risks
- Determining the effectiveness and implementability of phytoremediation based on results of field-scale testing
- Collecting soil and plant samples after a two-year field season to be used to determine the effectiveness of phytoremediation on the ANL-W soils
- Harvesting, compacting, incinerating, and disposing of the above- and below-ground plant matter that will be sent to a permitted landfill

- Continuing the planting/harvesting process for phytoremediation only if completion of the two-year field-scale testing is successful. This process would continue until RAOs are attained

- Installing access restrictions consisting of fences, bird netting, and posting warning signs

- Review of the remedy no less than every five years after the RAOs have been met until the year 2098

- Implementing DOE controls which limit residential land use for at least 100 years from now (2098).

Description of Contingent Remedy

If it is determined that the selected remedy of phytoremediation does not adequately reduce the principle risks to human health and the environment after completion of the two-year field season, a contingent alternative of excavation and disposal has been selected. The contingent remedy of excavation and disposal would be used to remove contaminated soils from the Industrial Waste Pond and associated Ditches A, B, and C (ANL-01), Main Cooling Tower Blowdown Ditch (ANL-01A), Sanitary Sewage Lagoons (ANL-04), Interceptor Canal-Mound (ANL-09), and the Industrial Waste Lift Station Discharge Ditch (ANL-35). The on-INEEL site disposal location for these contaminated soils could consist of a yet to be built Soils Repository at the Idaho Chemical Processing Plant or the Radioactive Waste Management Complex (RWMC). The final on-INEEL site location would be determined during the Remedial Design/Remedial Action phase for WAG 9. Excavation and disposal activities would not be initiated on the Sanitary Sewage Lagoons (ANL-04) until approximately 2033 when the ANL-W facility is scheduled for closure. The start of the phytoremediation for the Industrial Waste Pond (ANL-01) will not be initiated until the cooling water discharges from the sodium processing facility are completed. The final sodium cooling water discharges are planned for 2002. This delay in excavation and disposal startup for either site dose not pose any increase in the risks to human health and or the environment. The major components of the contingent remedy for ANL-W are:

- Contaminants in the waste areas will be excavated and transported to either the RWMC or the INEEL Soils Repository for on-INEEL disposal

- Verification sampling would be used to validate that the remaining soil concentrations are below the Remedial Action Objectives

- Review of the remedy no less than every five years after the RAOs have been met until the year 2098

- Implementation of DOE controls which limit residential land use for at least 100 years from now (2098).

The no action alternative is reaffirmed and selected as the appropriate alternative for the remaining 33 areas at the ANL-W facility. These 33 areas have risks that are at acceptable levels based on the information gathered during the remedial investigation.

The possibility exists that contaminated environmental media not identified by the INEEL FFA/CO or in this comprehensive investigation will be discovered in the future as a result of routine operations, maintenance activities, and decontamination and dismantlement activities at ANL-W. Upon discovery of a new contaminant source by DOE, IDHW, or EPA, that contaminant source will be evaluated and appropriate response action taken in accordance with the FFA/CO.

Statutory Determination

The selected remedy and the contingent remedy for the five sites at ANL-W have been determined to be protective of human health and the environment, to comply with federal and state requirements that are legally applicable or relevant and appropriate (applicable or relevant and appropriate requirements to the remedial actions), and to be cost effective.

The selected remedy of phytoremediation utilizes permanent solutions and alternative treatment technology to the maximum extent practicable, and satisfies the statutory preference for remedies that employ treatment that reduces toxicity, mobility, or volume as a principal element.

Because the selected remedy of phytoremediation will result in hazardous substances remaining on-site above levels for unlimited use, a review will be conducted within five years after commencement of remedial action to ensure that the remedy continues to provide adequate protection of human health and the environment. The agencies agree that No Action be taken at 33 additional areas.

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Signature Sheet

Signature sheet for the Record of Decision for the Waste Area Group 9 Operable Unit 9-04, at Argonne National Laboratory-West, part of the Idaho National Engineering and Environmental Laboratory, between the U.S. Department of Energy and the Environmental Protection Agency, with concurrence by the Idaho Department of Health and Welfare.

Chuck Clarke

Chuck Clarke, Regional Administrator
Region 10
U.S. Environmental Protection Agency

9/29/98
Date

Signature Sheet

Signature sheet for the Record of Decision for the Waste Area Group 9 Operable Unit 9-04, at Argonne National Laboratory-West, part of the Idaho National Engineering and Environmental Laboratory, between the U.S. Department of Energy and the Environmental Protection Agency, with concurrence by the Idaho Department of Health and Welfare.

John P. Kennedy
Acting Manager, Chicago Operations Office
U.S. Department of Energy

9/14/98
Date

Signature Sheet

Signature sheet for the Record of Decision for the Waste Area Group 9 Operable Unit 9-04, at Argonne National Laboratory-West, part of the Idaho National Engineering and Environmental Laboratory, between the U.S. Department of Energy and the Environmental Protection Agency, with concurrence by the Idaho Department of Health and Welfare.

JN Sandeval, Assistant Administrator — 07/24/98

Wallace N. Cory, Administrator
Division of Environmental Quality
Idaho Department of Health and Welfare

Date

Table of Contents

Figures

Tables

ACRONYMS

ANL-W	Argonne National Laboratory - West
ARARs	Applicable or Relevant and Appropriate Requirements
BLS	below land surface
CFA	Central Facilities Area
COC	Contaminant of Concern
COCA	Consent Order and Compliance Agreement
COPC	Contaminant of Potential Concern
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
DOE	Department of Energy
DOE-CH	Department of Energy-Chicago Operations Office
DOE-ID	Department of Energy-Idaho Operations Office
ERA	ecological risk assessment
EBR-II	Experimental Breeder Reactor II
FS	Feasibility Study
FFA/CO	Federal Facility Agreement and Consent Order
FCF	Fuel Cycle Facility
HQs	hazard quotients
HFEF/S	Hot Fuel Examination Facility South
IDHW	Idaho Department of Health and Welfare
INEEL	Idaho National Engineering and Environmental Laboratory
LMITCO	Lockheed Martin Idaho Technologies Company
MSL	mean sea level
NOAA	National Oceanic and Atmospheric Administration
NCP	National Oil and Hazardous Substances Pollution Contingency Plan
NPL	National Priorities List
O&M	Operations and Maintenance
OU	Operable Unit
PCBs	polycholorinated biphenyls
RAOs	remedial action objectives
RGs	remediation goals
RME	reasonable maximum exposure
ROD	Record of Decision
RI	Remedial Investigation
RCRA	Resource Conservation and Recovery Act
RWMC	Radioactive Waste Management Complex
SRP	Snake River Plain
SRPA	Snake River Plain Aquifer
TBC	to-be-considered
TREAT	Transient Reactor Test Facility
EPA	Environmental Protection Agency - Region 10
UMTRA	Uranium Mill Tailings Remedial Action
UCL	upper confidence limit
WAG 9	Waste Area Group 9
ZPPR	Zero Power Physics Reactor

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Waste Area Group 9 Record of Decision

1 DECISION SUMMARY

1.1 Site Name

The Idaho National Engineering and Environmental Laboratory (INEEL) is a government facility managed by the U.S. Department of Energy (DOE), located 32 miles (51 km) west of Idaho Falls Idaho, and occupies 890 square miles (2,305 km^2) of the northeastern portion of the Eastern Snake River Plain. The Argonne National Laboratory-West (ANL-W) is located in the southeastern portion of the INEEL, as shown in Figure 1-1. To better manage environmental investigations, the INEEL was subdivided into ten Waste Area Groups (WAGs). Identified contaminant releases sites in each WAG were in turn divided into operable units (OUs) to expedite the investigations and any required remedial actions. Waste Area Group 9 covers the ANL-W and contains four OUs that were investigated for contaminant releases to the environment. Within these four OUs, 37 known or suspected contaminant release sites have been identified. Two of the identified 37 release sites have been further subdivided into smaller areas based on their waste discharges and physical modeling parameter variations within a release site. Thus, the term "site" will herein refer to a named release site in one of the OUs. While "area" will herein be used to define all or a portion of an identified OU release site. This Record of Decision (ROD) applies to these 37 sites at WAG 9 and two sites from WAG 10, which, on the basis of the comprehensive remedial investigation (RI)/feasibility study (FS) for WAG 9, were identified as posing a potential risk to human health and/or the environment. Of these 39 sites, 33 are being recommended for "No Action." Figure 1-2 shows the locations of the eight areas where remedial action is proposed.

The INEEL lands are within the aboriginal land area of the Shoshone-Bannock Tribes. The Tribes have used the land and waters within and surrounding the INEEL for fishing, hunting, plant gathering, medicinal, religious, ceremonial, and other cultural uses since time immemorial. These lands and waters provided the Tribes their home and sustained their way of life. The record of the Tribes' aboriginal presence at the INEEL is considerable, and DOE has documented an excess of 1,500 prehistoric and historic archeological sites at the INEEL.

Facilities at the INEEL are primarily dedicated to nuclear research, development, and waste management. Surrounding areas are managed by the Bureau of Land Management for multipurpose use. The developed area within the INEEL is surrounded by a 500 square mile (1,295 km^2) buffer zone used for cattle and sheep grazing. Communities nearest to ANL-W are Atomic City (southwest), Arco (west), Butte City (west), Howe (northwest), Mud Lake (northeast), and Terreton (northeast). In the counties surrounding the INEEL, approximately 45% is agricultural land, 45% is open land, and 10% is urban. Sheep, cattle, hogs, poultry, and dairy cattle are produced; and potatoes, alfalfa, sugar beets, wheat, barley, oats, canola, sunflower, forage, and seed crops are cultivated. Most of the land surrounding the INEEL is owned by private individuals or the U.S. Government, as shown in Figure 1-3.

Public access to the INEEL is strictly controlled by fences and security personnel. State Highways 22, 28, and 33 cross the northeastern portion of the INEEL approximately 20 miles (32.2 km), and U.S. Highways 20 and 26 cross the southern portion approximately 5 miles (8 km) away from ANL-W, respectively. A total of 90 miles (145 km) of paved highways pass through the INEEL and are used by the general public.

The Snake River Plain Aquifer (SRPA), the largest potable aquifer in Idaho, underlies the Eastern Snake River Plain and the INEEL. The aquifer is approximately 200 miles (322 km) long, 20 to 60 miles (32.2 to 96.5 km) wide, and covers an area of approximately 9,600 square miles (24,853 km^2). The depth to the SRPA varies from approximately 200 feet (61 m) in the northeastern corner of the INEEL to approximately 900 feet (274 m) in the southeastern corner. This change in groundwater depth in the northeastern corner to the southeastern corner occurs over a horizontal distance of 42 miles (67.6 km). Depth to groundwater is approximately 640 feet (195 m) below ANL-W and the groundwater flow direction is south-southwest. Drinking water for employees at ANL-W is obtained from two production wells located in the west-central portion of the ANL-W facility.

Most INEEL facilities are currently operated by one of three Government contractors: Lockheed Martin Idaho Technologies Company (LMITCO), Westinghouse Electric Corporation, and Argonne National Laboratory-West. These contractors conduct various programs at the INEEL under the supervision of three DOE offices: DOE-Idaho (DOE-ID), Department of Defense-Pittsburgh Naval Reactors Office, and DOE-Chicago (DOE-CH).

ANL-W, a prime operating contractor to DOE-CH, began a redirected nuclear research and development program in FY 1995. The redirected program involves research to help solve near-term high priority missions including the treatment of DOE spent nuclear fuel and reactor decontamination and decommissioning technologies. ANL-W is also currently in the process of conducting shutdown and termination activities for the Experimental Breeder Reactor II (EBR-II). Within the ANL-W site are a number of research and support facilities that contribute to the total volume of waste generated at ANL-W. These facilities currently generate radioactive low-level waste, radioactive transuranic waste, hazardous waste, mixed waste, sanitary waste, and industrial waste. Approximately 750 people are employed at the ANL-W facility.

The ANL-W facility does not have any identified wetlands, is not in the 100-year floodplain, and has been screened as to it's potential for habitat to rare and endangered species. One facility at ANL-W, the EBR-II reactor may be listed as a historic building eligible for listing on the National Register in the future. The selected and contingent remedial alternatives would not impact the EBR-II facility.

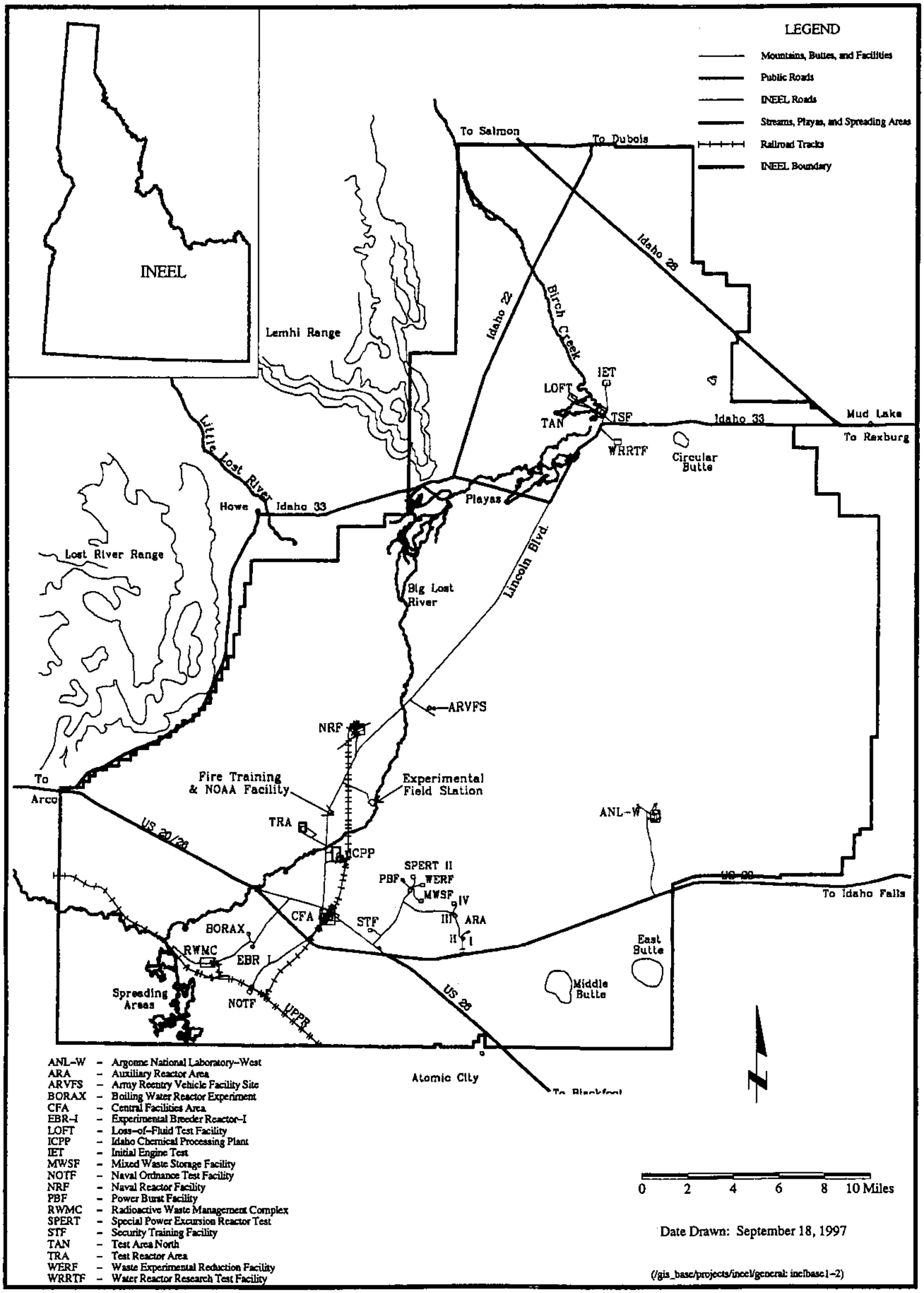

Figure 1-1. Location of the INEEL and Major Facilities with respect to the State of Idaho.

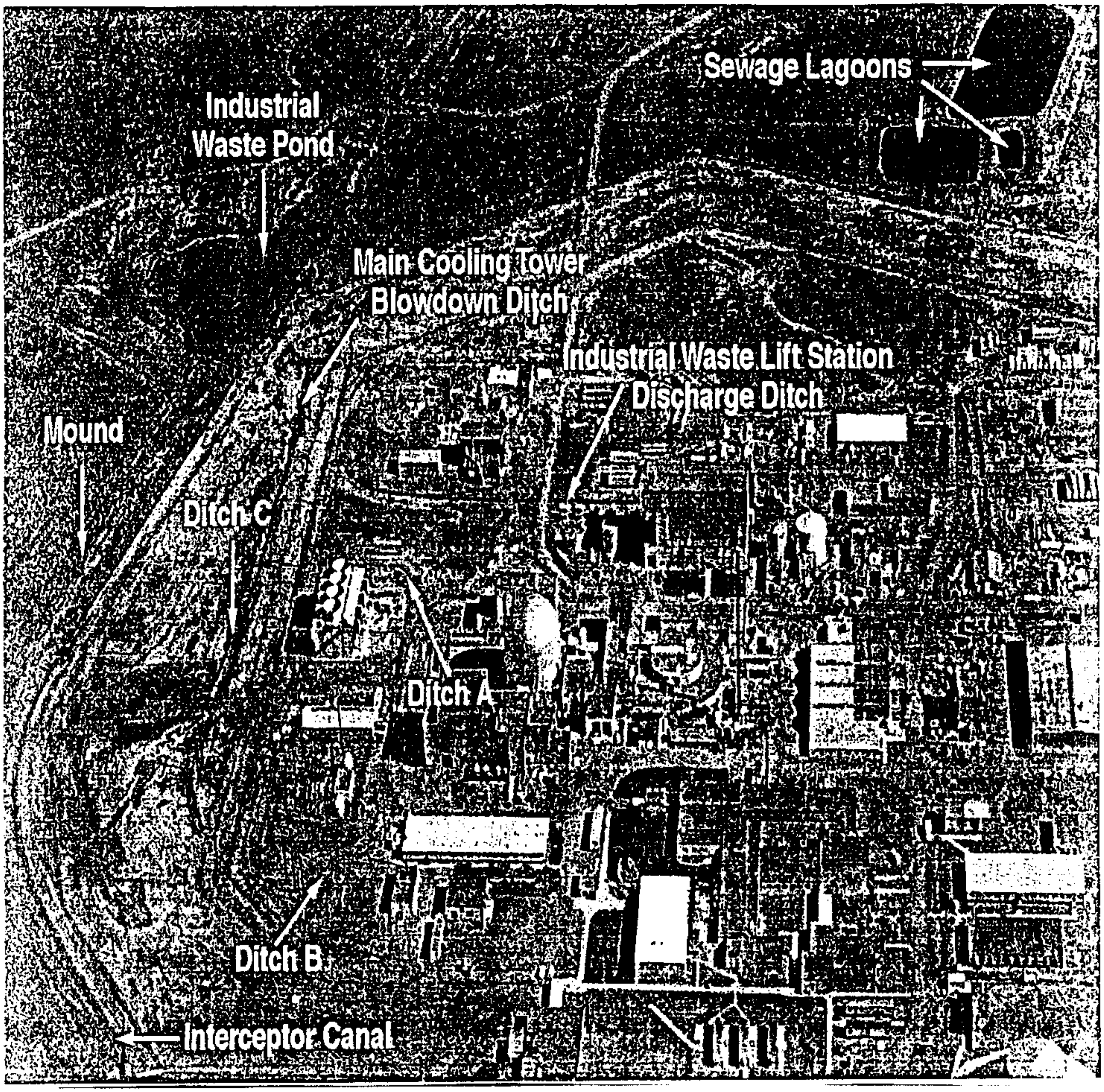

Figure 1-2. Location of the Argonne National Laboratory-West Sites of Concern.

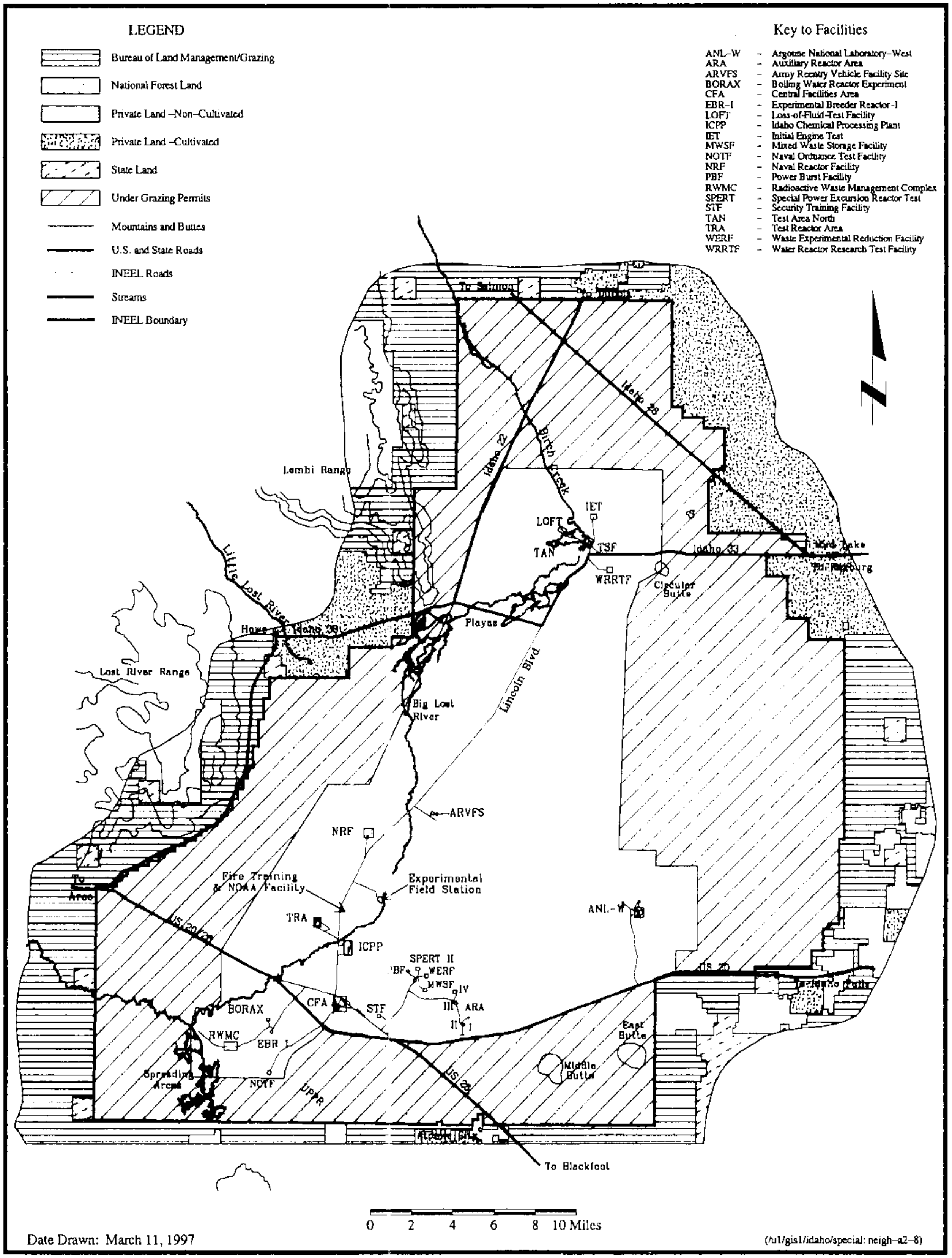

Figure 1-3. Ownership of Lands Surrounding the INEEL.

2 SITE HISTORY AND ENFORCEMENT ACTIVITIES

2.1 INEEL Site Description

The INEEL site occupies approximately 890 square miles (2,300 km^2) of the northwestern portion of the eastern Snake River Plain (SRP) in southeast Idaho. The INEEL site is nearly 39 miles (63 km) long from north to south and about 36 miles wide (east-west) in its broadest southern portion. The INEEL includes portions of five Idaho counties (Bingham, Bonneville, Butte, Clark, and Jefferson) and lies within Townships 2 to 8 N and Ranges 28 to 34 E, Boise baseline and meridian. Figure 2-1 shows the location of the INEEL with respect to the counties and State.

The surface of the INEEL is a relatively flat, semiarid, sagebrush desert, with predominant relief being manifested either as volcanic buttes jutting up from the desert floor or as unevenly surfaced basalt flows or flow vents and fissures. Elevations on the INEEL range from 5,200 ft in the northeast to 4,750 ft in the central lowlands, with an average elevation of 4,975 ft. Figure 2-2 shows the shaded relief map of the WAG 9 and the rest of the INEEL.

2.2 ANL-W Site History

The ANL-W was established in the mid 1950s and is located approximately 30 miles west of Idaho Falls. ANL-W houses extensive support facilities for three major nuclear reactors: Transient Reactor Test Facility (TREAT), EBR-II, and the Zero Power Physics Reactor (ZPPR). The location of the main facilities at ANL-W are shown in Figure 2-3.

The first reactor to operate at the ANL-W site was TREAT, which was built in 1959. As its name implies, TREAT was designed for overpower transient tests of fuel. Its driver fuel, consisting of finely divided uranium oxide in a graphite matrix, has a high heat capacity that enables it to withstand tests in which experimental fuel may be melted. Used extensively at first for safety tests of water-reactor fuels, TREAT is now used mainly for safety tests for various fuel types as well as for non reactor experiments. It has periodically undergone modifications as part of the TREAT upgrade project.

The EBR-II a 62.5 megawatt thermal reactor went into operation in 1964 capable of producing 19.5-megawatts of electrical power in the liquid metal reactor power plant. It is a pool-type sodium-cooled reactor, designed to operate with metallic fuel. It was provided with its own Fuel Cycle Facility (FCF) adjacent to the reactor building for remote pyrometallurgical reprocessing and refabrification of reactor fuel. The Fuel Cycle Facility operated from 1964 providing five complete core loadings of recycled fuel for EBR-II.

Over the years, the mission of the EBR-II has been redirected from that of a power-plant demonstration with integral fuel cycle to that of an irradiation test facility for mixed uranium-plutonium fuels for future liquid metal reactors. The pyrometallurgical process used in the Fuel Cycle Facility was not suitable for ceramic fuels so the Fuel Cycle Facility was converted to a Hot Fuel Examination Facility South (HFEF/S).

EBR-II continued to be fueled with metallic uranium driver fuel for operating convenience. This fuel was gradually improved to greatly increase its burnup, thus contributing to a high plant factor for irradiation tests. Over the years of operation, much valuable operating experience has been gained on sodium systems, including the removal and maintenance of primary sodium pumps and other components. In the 1970s, the mission of the EBR-II was again shifted in emphasis, this time to the Operational Reliability Testing Program. This program was aimed at studying the milder but more probable types of fuel and reactor malfunctions that could lead to accident sequence. In addition to preventing accidents, its aim was to better define the operating limits and tolerable faults in reactor operation, thus leading to both safer and more economical plants. The components of this program in EBR-II included tests of fuel to and beyond cladding breach, loss-of-coolant flow tests, mild power transients, and studies of man-machine interfaces.

In the early 1980s, ANL-W reexamined the basic design of liquid-metal-cooled fast reactors. The results of this study led to the Integral Fast Reactor (IFR) concept. The IFR incorporates four basic elements: sodium cooling; a pool configuration; a compact, integral fuel cycle facility; and a ternary metal alloy fuel. Modifications to the EBR-II and the HFEF/S facilities have been made to support the pyroprocessing and fuel manufacturing for the IFR demonstration project. Since 1994, ANL-W has been conducting shutdown and termination activities for the EBR-II. These shutdown activities include defueling and draining the primary and secondary sodium loops and placing the reactor in a radiologically safe shutdown condition. The Fuel Cycle Facility has been converted to a Fuel Conditioning Facility. The mission of the Fuel conditioning Facility is to electrochemically treat EBR-II fuel to create radioactive waste forms which are acceptable for disposal in a national geologic repository.

The ZPPR was put into operation at ANL-W in 1969. The ZPPR is large enough to enable core-physics studies of full-scale breeder reactors that will produce up to 1,000 megawatts. ZPPR has also been used for mockups of metallic cores and space-reactor cores. ZPPR was placed in programmatic standby in fiscal year 1989.

Various chemical and radioactive wastes were generated from these three reactors and the support facilities at ANL-W. The operation of these facilities and the corresponding waste streams have been evaluated and documented in the Facility Assessment and Screening document of 1973. This document, which is based on process knowledge, has been used as an initial starting point for ANL-W cleanup activities.

2.3 Identification of Release Sites

Potential release sites identified at ANL-W facilities in the Federal Facility Agreement and Consent Order (FFA/CO) include wastewater structures and leaching ponds, underground storage tanks, rubble piles, cooling towers, an injection well, french drains, and assorted spills. Possible COPCs at the various ANL-W sites include primarily petroleum products, acids, bases, PCBs, radionuclides, and heavy metals. These are the chemical and radioactive wastes generated from the scientific and engineering research at ANL-W.

2.4 Enforcement Activities

In July 1989, the Environmental Protection Agency proposed listing the INEEL on the National Priorities List (NPL) of the National Oil and Hazardous Substances Pollution Contingency Plan (NCP).

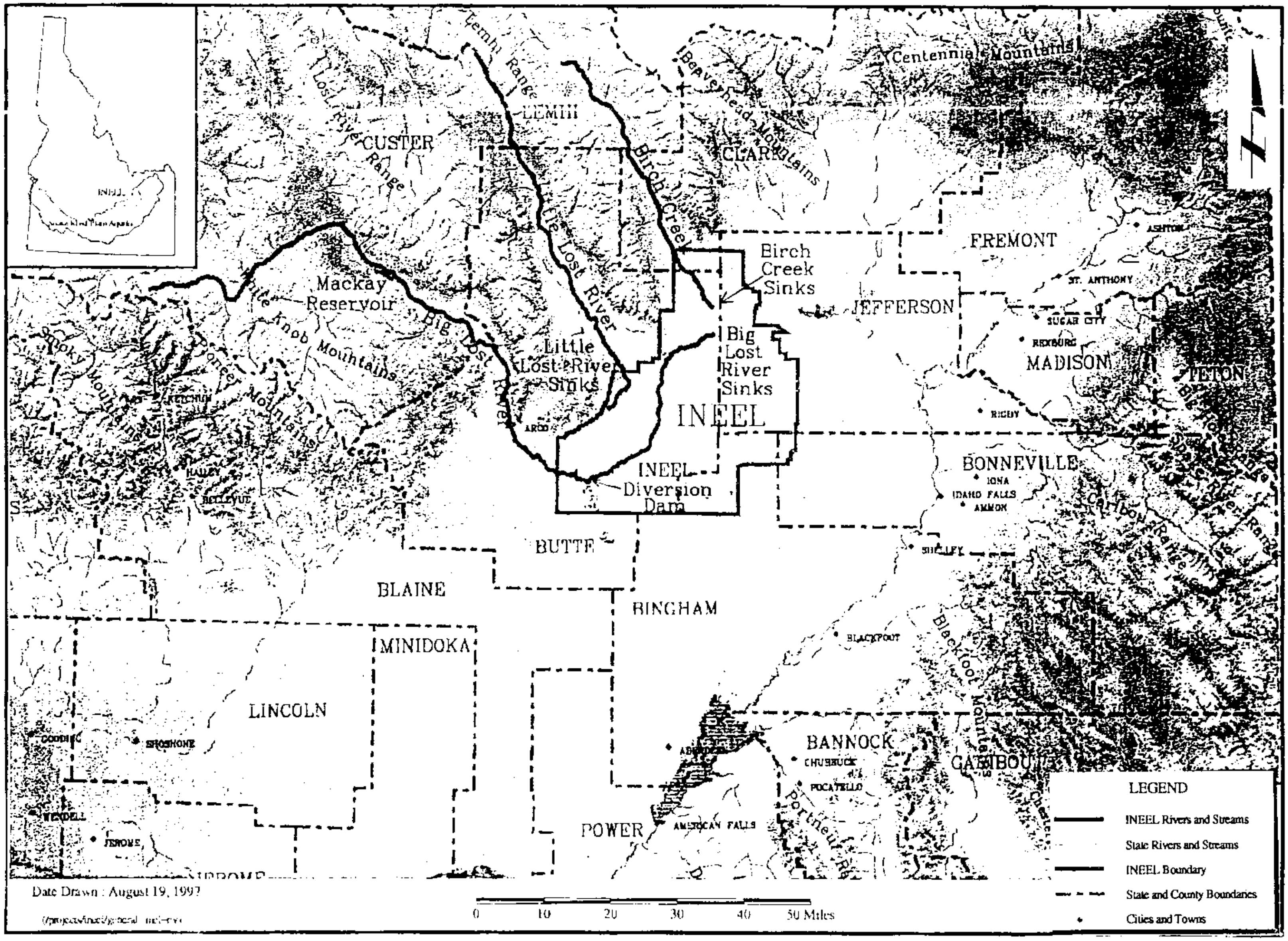

Figure 2-1. Location of INEEL with respect to counties.

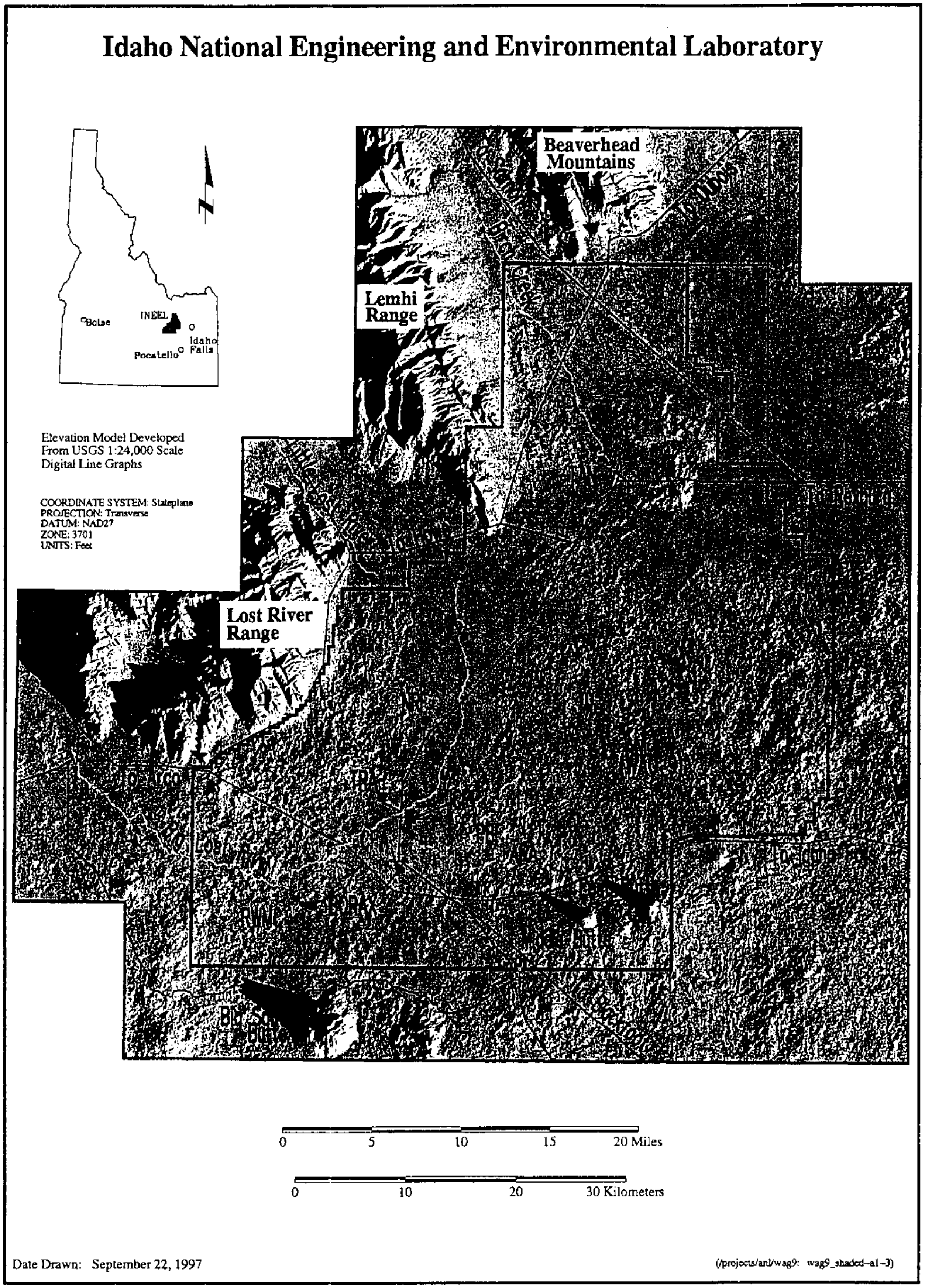

Figure 2-2. Shaded Relief Map of WAG 9 and INEEL.

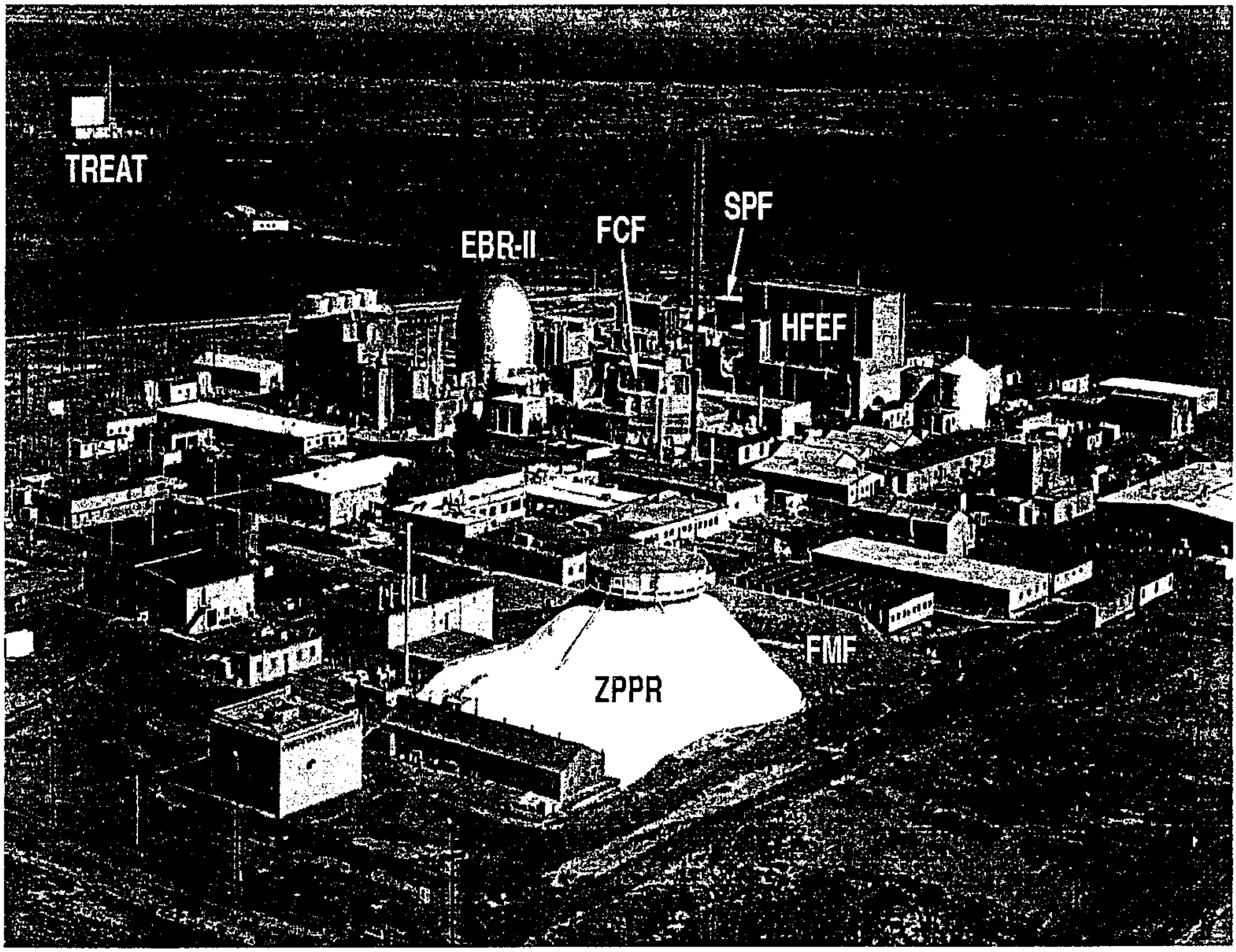

Figure 2-3. Aerial View of the ANL-W Facility Showing the Main Facilities.

EBR-II	-Experimental Breeder Reactor
FCF	-Fuel Cycle Facility
FMF	-Fuel Manufacturing Facility
HFEF	-Hot Fuel Examination Facility
SPF	-Sodium Processing Facility
ZPPR	-Zero Power Physics Reactor
TREAT	-Transient Reactor Test Facility

The EPA issued a final ruling that listed the INEEL as an NPL site in November 1989. The FFA/CO was developed to establish the procedural framework and schedule for developing, prioritizing, implementing, and monitoring response actions at the INEEL in accordance with CERCLA, the Resource Conservation and Recovery Act (RCRA), and the Idaho Hazardous Waste Management Act. The DOE, EPA and IDHW have determined that hazardous waste release sites at ANL-W would be remediated through the CERCLA process, as defined in the FFA/CO, which superseded the existing RCRA-driven Consent Order and Compliance Agreement requirements. The FFA/CO identified 4 OUs consisting of 19 sites within Waste Area Group 9 that required additional activities under the CERCLA process. An additional 18 sites were determined to need no further action at the time the FFA/CO was signed. Thus, a total of 37 WAG 9 sites were evaluated during the OU 9-04 Comprehensive RI/FS process and the results are summarized in this ROD.

One unit in OU 9-04 [Main Cooling Tower Blowdown Ditch (ANL-01A)] was originally included as a Land Disposal Unit under the RCRA Consent Order and Compliance Agreement (COCA) on the basis that corrosive liquid wastes were discharged after 1980. DOE, along with the EPA and IDHW WAG 9 managers, have determined that the Main Cooling Tower Blowdown Ditch is a RCRA Land Disposal Unit and will be remediated under the CERCLA process in accordance with the applicable substantive requirements of RCRA/Hazardous Waste Management Act (HWMA), if an unacceptable risk to human health or the environment. However, the FFA/CO has only adopted RCRA corrective action (3004 (u) & (v)), and not RCRA/HWMA closure. Therefore, upon completion of the remedial action, the DOE must receive approval from the IDHW Department of Environmental Quality director that the Main Cooling Tower Blowdown Ditch has been closed pursuant to RCRA/HWMA closure requirements.

The OU 9-04 comprehensive RI/FS conducted ANL-W resulted in the identification of eight areas with potential risk to human health and/or the environment that would require some type of remedial action (W7500-000-ES-02, October 1997). The Proposed Plan (January 1998) identified the agencies' preferred alternative for the eight areas of concern at ANL-W.

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3 HIGHLIGHTS OF COMMUNITY PARTICIPATION

In accordance with CERCLA §113(k)(2)(B)(I-v) and §117, a series of opportunities for public information and participation in the RI and decision process for the WAG 9, ANL-W, was provided to the public from March 1994 through March 1998. The opportunities to obtain information and provide input include "kickoff" fact sheets, which briefly discussed the status of the comprehensive investigation, articles in the *INEEL Reporter* (a publication of the INEEL's Environmental Restoration Program), three Citizens' Guide supplemental updates, presentations to members of the Citizens Advisory Board, a proposed plan January 1998, and public meetings. Specific details on how each of the opportunities for the citizens to obtain additional information on WAG 9 are presented below.

Articles in the March 1994 and November/December 1997 issues of the *INEEL Reporter* were distributed to approximately 6,700 members of the INEEL Community Relations Plan mailing list. The articles contained status reports on activities conducted at WAG 9 in addition to information on how to get additional information in the INEEL Information Repositories.

Three Citizens' Guide supplemental updates in March/April 1996, April/May 1996, and 1997 annual guide were also mailed to about 6,700 members of the public on the INEEL Community Relations Plan mailing list. These Citizen's Guide supplemental updates had specific sections on cleanup activities in WAG 9. Each of the Citizens' Guide supplemental updates also included information on how to get more information about WAG 9 via the internet, toll-free phone number, Administrative Record/Information Repositories, videos, and the INEEL Regional Office in Boise.

The kickoff fact sheet was mailed in September 1996 to members of the public on the INEEL Community Relations Plan mailing list to encourage participation prior to the initiation of work on the Comprehensive RI/FS. The information on how to request a briefing, or to get more information on OU 9-04 documents was printed on the back of the kickoff fact sheet.

On January 20, 1998, a brief presentation on the proposed plan was presented to the Citizens Advisory Board. The advisory board consists of a group of 15 individuals, representing the citizens of Idaho, who make recommendations to DOE, EPA, and the State of Idaho regarding environmental restoration activities at the INEEL. The Citizens Advisory Board meetings are open to the general public.

Copies of the proposed plan were mailed to approximately 6,700 members of the public on the INEEL Community Relations Plan mailing list on January 6, 1998, urging citizens to comment of the proposed plan and to attend public meetings. Display advertisements announcing the same information concerning the availability of the proposed plan and the locations of public meetings, and the comment period extension, appeared in six regional newspapers during the weeks of January 12 and 19, and February 9 in Idaho Falls, Boise, Moscow, Fort Hall, Pocatello, and Twin Falls. Large display advertisements appeared in the following newspapers: the Post Register (Idaho Falls);the Sho-Ban News (Fort Hall); the Idaho State Journal (Pocatello); the Times News (Twin Falls); the Idaho Statesman (Boise); and the Daily News (Moscow).

In January 1998, DOE issued a news release to more than 100 media contacts informing them of the beginning of a 30-day public comment period pertaining to the WAG 9 ANL-W proposed plan. This comment period began January 12, and ended on March 12, 1998 in response to a request from the public, for a 30 day extension. Most of the news releases resulted in a short note in community calendar sections of the newspapers and in public service announcements on radio stations. The fact sheets, INEEL Reporter, and the proposed plan all identified that additional documentation on WAG 9 is available in the Administrative Record section of the INEEL Information Repositories located in the INEEL Technical Library in Idaho Falls, in the INEEL Boise Office, and in public libraries in Fort Hall, Pocatello, and Moscow.

For the general public, the activities associated with participating in the decision-making process included receiving the proposed plan, receiving telephone calls, attending the availability sessions one-half hour before the public meetings to informally discuss the issues, and submitting verbal and written comments to the agencies during the 60-day public comment period. At the request of the Shoshone-Bannock Tribes, a informal presentation of the proposed plan was given to Tribal members and their technical staff on January 7, 1998.

Postage-paid business-reply comment forms were available to those attending the public meetings. The forms were used to submit written comments either at the meeting or by mail. In addition, the reverse side of the meeting agenda contained a form for the public to use in evaluating the effectiveness of the meetings. A court reporter was present at each meeting to keep transcripts of discussions and public comments. The meeting transcripts were placed in the Administrative Record section for the WAG 9, OU 9-04 in the five INEEL Information Repositories. For those who could not attend the public meetings, but wanted to make formal written comments, a postage-paid written comment form was attached to the proposed plan.

A Responsiveness Summary has been prepared and is included as Appendix A to this ROD. All formal verbal comments presented at the public meetings and all written comments are included in Appendix A and in the Administrative Record for the ROD. Those comments are annotated to indicate who made the comment and the page number where the DOE response can be found in the Responsiveness Summary.

A total of about 75 people not associated with the project attended the public meetings. Overall, nine citizens or groups provided formal comments. All comments received on the proposed plan were considered during the development of this ROD. The decision document presents the selected remedial action for the WAG 9, OU 9-04, chosen in accordance with CERCLA, as amended by Superfund Amendments and Reauthorization Act and, to the extent practicable, the National Contingency Plan. The decision for this site is based on the information in the Administrative Record for OU 9-04.

4 SCOPE OF OPERABLE UNITS AND RESPONSE ACTIONS

Under the FFA/CO, the INEEL is divided into 10 WAGs, of which ANL-W is included as WAG 9. WAG 9 is further subdivided into four OUs that included a total of 37 release sites. The four OUs are classified as: Remedial Investigation Sites, Track 2 Sites, Track 1 Sites, "No Action" Sites. In addition to the WAG 9 sites, two sites from WAG 10 are included in the evaluation of WAG 9. The inclusion of these two WAG 10 sites into the WAG 9 ROD was based on the close physical location of these sites to other WAG 9 facilities. These WAG 10 sites did not have individual risks but may add to the cumulative risks of WAG 9. Table 4-1 shows the 39 sites that were evaluated as part of the OU 9-04 Comprehensive RI/FS, 37 sites from WAG 9, and two sites from WAG 10.

The task of the "comprehensive" RI/FS is to evaluate contamination of environmental media (soil, air, and groundwater) and the potential risks to human health and the environment from exposure via those pathways. Each of the retained sites has undergone a "comprehensive"evaluation because risks from all known and potential release sites within WAG 9 and the two sites from WAG 10 have been evaluated. In addition, it is also "cumulative" because the receptor may be exposed to contamination from multiple release pathways (e.g., air and groundwater exposure pathways), from multiple release sites. Analyzing the air and groundwater pathways in a cumulative manner is necessary because contamination from all release sites within a WAG are typically isolated from one another with respect to the soil pathway exposure routes. Therefore, the soil pathway exposure route is analyzed on a release site specific or "noncumulative" basis in the INEEL comprehensive risk assessments.

From the evaluation of the 39 sites that were evaluated as part of this ROD, eight areas at ANL-W have actual or threatened releases of hazardous substances, which, if not addressed by implementing the response actions selected in this ROD, may present an imminent and substantial endangerment to public health, welfare, or the environment. These eight areas are subunits of five CERCLA sites (ANL-01, ANL-01A, ANL-04, ANL-09, and ANL-35) identified in the FFA/CO. This includes one area with only unacceptable risks to human health, five areas with only unacceptable risks to the ecological receptors, and two sites with unacceptable risks to both human health and the ecological receptors. The screening, development, and detailed analysis of the remedial alternatives resulted in the selected alternative for each of the retained sites. These alternatives met the goals established for reducing or eliminating risks to human health and the environment and for complying with applicable or relevant and appropriate requirements (ARARs).

In addition to the eight areas that require some type of remedial action, this comprehensive ROD also addresses 33 WAG 9 areas that do not pose an unacceptable risk to human health or the environment, based on the evidence compiled during the OU 9-04 Comprehensive RI/FS. These 33 areas are being recommended for No Action and, with approval of this ROD, the No Action decision is formalized.

Table 4-1. Summary of data available for WAG 9 and WAG 10 release sites evaluated in the OU 9-04 comprehensive RI/FS.

OU	Site	Site description	COCs	Data available	Source of information
None	ANL-10	Dry Well between T-1 and ZPPR Mound	None	Interviews with facility personnel indicate that the dry well was hooked up to a septic tank which was removed in 1966. Therefore, no source exists.	Initial Assessment Report for ANL-W (1986).
None	ANL-11	Waste Retention Tank 783	None	Interviews of former facility operators indicate that no hazardous constituents were ever disposed at the tank; Therefore, no source exists.	Initial Assessment Report for ANL-W (1986), Summary Assessment Report (1990a).
None	ANL-12	Suspect Waste Retention Tank by 793	None	Interviews of former facility operators indicate that the tank was removed in 1979 and that no source exists.	Initial Assessment Report for ANL-W (1986), Summary Assessment Report (1990a).
None	ANL-14	Septic Tank and Drain Fields (2) by 753	None	Process knowledge and interviews with plant services personnel indicate that the only materials disposed were trace quantities of cleaning supplies. The tank was removed in 1979 and no source exists.	Initial Assessment Report for ANL-W (1986), Summary Assessment Report (1990a).
None	ANL-15	Dry Well by 768	None	Process knowledge and interviews with facility personnel indicate that the only hazardous constituent disposed was hydrazine.	Initial Assessment Report for ANL-W (1986), Summary Assessment Report (1990a).
None	ANL-16	Dry Well by 759 (2)	None	Process knowledge and interviews with facility personnel indicate that the only hazardous constituent disposed was hydrazine.	Initial Assessment Report for ANL-W (1986), Summary Assessment Report (1990a).
None	ANL-17	Dry Well by 720	None	Process knowledge and interviews with facility personnel, no hazardous constituents were ever disposed and therefore no source exists.	Initial Assessment Report for ANL-W (1986), Summary Assessment Report (1990a).
None	ANL-18	Septic Tank and Drain Field by 789	None	The septic tank and drain field were removed in 1979. Process knowledge and interviews with facility personnel indicate that no hazardous constituents were disposed at the site.	Initial Assessment Report for ANL-W (1986).
None	ANL-20	Septic Tank and Drain Field by 793	None	Engineering drawings, and interviews with employees indicate no hazardous constituents were disposed and therefore no source exists.	Initial Assessment Report for ANL-W (1986), Summary Assessment Report (1990a).

Table 4-1. (continued).

OU	Site	Site description	COCs	Data available	Source of information
None	ANL-21	TREAT Suspect Waste Tank and Leaching Field (Non-radioactive)	None	Process knowledge and interviews with plant services personnel indicate that the only materials disposed were trace quantities of cleaning supplies, therefore, no source exists.	Initial Assessment Report for ANL-W (1986), Summary Assessment Report (1990a).
None	ANL-22	TREAT Septic Tank and the current Leaching Field	None	Process knowledge and interviews with facility personnel indicate that no hazardous constituents were disposed at the site; therefore, no source exists.	Initial Assessment Report for ANL-W (1986).
None	ANL-23	TREAT Seepage Pit and Septic Tank West of 720	None	Process knowledge and interviews with facility personnel indicate that no hazardous constituents were disposed at the site. The tank was filled with sand in 1980; therefore, no source exists.	Initial Assessment Report for ANL-W (1986).
None	ANL-24	Lab and Office Acid Neutralization Tank	None	Process knowledge and interviews with facility personnel indicate that no hazardous constituents were disposed at the site. Therefore, no source exists.	Initial Assessment Report for ANL-W (1986).
None	ANL-25	Interior Building Coffin Neutralization Tank	None	After neutralization with sodium hydroxide, the liquid was transferred to the retention tank. Thus, no source exists.	Initial Assessment Report for ANL-W (1986), Summary Assessment Report (1990a).
None	ANL-26	Critical Systems Maintenance Degreasing Unit	None	The degreasing unit is self-contained and is inside another building. No evidence exists (from spill records and interviews) of any hazardous constituents being spilled. All wastes are collected by a commercial vendor, therefore no source exists.	Initial Assessment Report for ANL-W (1986), Summary Assessment Report (1990a).
None	ANL-27	Plant Services Degreasing Unit	None	The degreasing unit is self-contained and is inside another building. No evidence exists (from spill records and interviews) of any hazardous constituents being spilled. All wastes are collected by a commercial vendor; therefore no source exists.	Initial Assessment Report for ANL-W (1986), Summary Assessment Report (1990a).
None	ANL-32	TREAT Control Building 721 Septic Tank and Leach Field (Present)	None	Process knowledge and interviews with facility personnel indicate that no hazardous constituents were disposed at the site; therefore, no source exists.	Initial Assessment Report for ANL-W (1986), Summary Assessment Report (1990a).
None	ANL-33	TREAT Control Building 721 Septic Tank and Seepage Pit	None	Process knowledge and interviews with facility personnel indicate that no hazardous constituents were disposed at the site. The tank was removed in 1978 and no source exists.	Initial Assessment Report for ANL-W (1986), Summary Assessment Report (1990a).

Table 4-1. (continued).

OU	Site	Site description	COCs	Data available	Source of information
9-01	ANL-04	ANL Sewage Lagoons	Metals and radionuclides	Sludge samples were collected in 1994 and analyzed for metals and radionuclides.	Track 1 Decision Documentation Package (ANL-W 1995a) identified further evaluation of 1 million gallon water loss. This was evaluated in the OU 9-04 RI/FS Work Plan. The data is also summarized in Section 3.1.1.1 of this OU 9-04 RI/FS report.
9-01	ANL-19	Sludge Pit West of T-7 (Imhoff Tank)	None	Engineering drawings indicate that industrial wastes and laboratory process wastes were discharged to a separate waste piping system. The tank was filled with dirt in 1978. Therefore no source exists.	Track 1 Decision Documentation Package (RUST Geotech 1994a).
9-01	ANL-28	EBR-II Sump	Sulfuric acid and hexavalent chromium	Based on water chemistry results, the hexavalent chromium was reduced to trivalent chromium and the pH of the liquid discharged typically ranged between 4-11.	Track 1 Decision Documentation Package (RUST Geotech 1994b).
9-01	ANL-29	Industrial Waste Lift Station	Silver	Sludge samples were collected in 1986, 1990, and 1995 and analyzed for silver.	Track 1 Decision Documentation Package (ANL-W 1995b).
9-01	ANL-30	Sanitary Waste Lift Station	Silver	Process knowledge, review of historical records, and drawings indicate there was a release of silver to the site.	Track 1 Decision Documentation Package (ANL-W 1994a).
9-01	ANL-36	TREAT Photo Processing Discharge Ditch	Silver	Soil samples were collected in 1987 and analyzed for silver.	Track 1 Decision Documentation Package (RUST Geotech 1994c).
9-01	ANL-60	Knawa Butte Debris Pile	None	Process knowledge of where the soil and debris was moved from indicate there is no source at the site.	Track 1 Decision Documentation Package (ANL-W 1994b).
9-01	ANL-61+	EBR-II Transformer Yard	PCBs	Analytical results from the soil at this site during removal of the transformers.	Track 1 Decision Documentation Package (RUST Geotech 1994d).
9-01	ANL-61A+	PCB-contaminated soil adjacent to ANL-61	PCBs	Analytical results from the soil at this site during removal of the transformers.	Track 1 Decision Documentation Package for ANL-61 (RUST Geotech 1994d).
9-01	ANL-62	Sodium Boiler Building (766) Hotwell	None	Process knowledge and interviews with facility personnel indicate that the only hazardous constituents disposed were hydrazine and tritium.	Track 1 Decision Documentation Package (ANL-W 1994c).
9-01	ANL-63	Septic Tank 789-A	None	Process knowledge and interviews with facility personnel indicate that no hazardous constituents were disposed at the site. Therefore no source exists.	Track 1 Decision Documentation Package (RUST Geotech 1994e).

Table 4-1. (continued).

OU	Site	Site description	COCs	Data available	Source of information
9-02	ANL-08	EBR-II Leach Pit (Radioactive)	Radionuclides, metals, dioxins, and semivolatile organic compounds	Analytical results from sludge soil and basalt and groundwater samples collected in 1991 and 1993.	9-02 Track 2 Summary Report (RUST Geotech 1994b).
9-03	ANL-05	ANL Open Burn Pits #1, #2, and #3	Metals, radionuclides, VOCs, PAHs, and dioxins/furans	Site inspections, historical records, and analytical results from soil samples collected in 1988 and 1994.	Revised 9-03 Track 2 Summary Report (ANL-W 1995c).
9-03	ANL-31	Industrial/Sanitary Waste Lift Station (Industrial Side Not Used)	Metals and radionuclides	Historical operational knowledge and analytical results of the sampling conducted in 1995.	Revised 9-03 Track 2 Summary Report (ANL-W 1995c).
9-03	ANL-34	Fuel Oil Spill by Building 755	Fuel Oil (benzene/ naphthalene)	Modeling results based on the estimated volume of the fuel oil spill.	Revised 9-03 Track 2 Summary Report (ANL-W 1995c).
9-04	ANL-01	Industrial Waste Pond and Cooling Tower Blowdown Ditches A, B, and C)	Metals, radionuclides, VOCs, and herbicides	Analytical results from soil, sludge, and water samples at the IWP collected in 1986, 1987, 1988 and 1994 and analytical results from soil samples collected at the ditches in 1988 and 1994.	Revised Preliminary Scoping Package (ANL-W 1995d).
9-04	ANL-01A	Main Cooling Tower Blowdown Ditch	Metals, radionuclides, and semivolatile organic compounds	Analytical results from soil samples collected in 1987, 1988 and 1994.	Revised Preliminary Scoping Package (ANL-W 1995e).
9-04	ANL-09	ANL Interceptor Canal -Canal, and -Mound portions	Metals and radionuclides	Analytical results from soil samples collected in 1994.	Revised Preliminary Scoping Package (ANL-W 1995f).
9-04	ANL-35	Industrial Waste Lift Station Discharge Ditch	Metals, radionuclides, VOCs, and dioxin/furans	Analytical results from soil samples were collected in 1988 and 1994 and analytical results from water samples collected in 1988.	Revised Preliminary Scoping Package (ANL-W 1995g).
9-04	ANL-53	Cooling Tower Riser Pits	Metals	Analytical results from soil samples collected in 1989.	Preliminary Scoping Package (ANL-W 1993).
10-06*	-	ANL-W Windblown Soil	Radionuclides	Analytical results from RESL 1993	RI/FS for 10-06 (LMIT 1995)
10-06*	-	ANL-W Stockpile	Radionuclides	48 Soil Samples in 1994	RI/FS for 10-06 (LMIT 1995)

+ ANL-61 and ANL-61A is counted as one site that has undergone two phases of cleanup.

* These OU 10-06 sites have been added for inclusion in the 9-04 RI/FS.

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5 SUMMARY OF SITE CHARACTERISTICS

The characteristics such as physiography, meteorology, hydrology, soils, and ecology specific to the ANL-W site are summarized in Sections 5.1 through 5.6. These characteristics are included to help the reader understand the specific details needed to assess the alternatives in the ROD. A complete discussion of each of these can be found in chapter 2 of the 9-04 Comprehensive RI/FS. Sections 5.7.3 through 5.7.13 identify the nature and extent of contamination at each of the eight areas that are retained for cleanup.

5.1 Physiography

The SRP, is the largest continuous physiographic feature in southern Idaho. This large topographic depression extends from the Oregon border across Idaho to Yellowstone National Park and northwestern Wyoming. Figure 2-1 shows the location of the Snake River Plain Aquifer with respect to the INEEL and the State of Idaho. The portion of the SRP occupied by the INEEL may be divided into three minor physical provinces: a central trough that extends to the northeast through the INEEL and two flanking slopes that descend to the trough, one from the mountains to the northwest and the other from a broad ridge on the plain to the southeast.

The ANL-W facility is found in the southeastern portion of the INEEL and is responsible for a roughly rectangular-shaped administrative area encompassing approximately 890 acres. A double security fence with largest east-west and north-south dimensions of 580 m and 765 m (1,902 ft and 2,512 ft), respectively, surrounds the major portion of ANL-W. Located inside the fenced area are more than 60 buildings and 13 temporary trailers. Located outside the security fence are six buildings/facilities that support the ANL-W facility. One building that support the Transient Reactor Test Facility, the three sanitary Sewage Lagoons, the Radioactive Scrap and Waste Facility, the security forces firing range, the parking lot, and the helicopter landing pad. Outside the perimeter of ANL-W are unpaved roads, groundwater monitoring wells, the interceptor canal, industrial waste pond, three old construction rubble burn areas, and borrow excavation pits used for construction at ANL-W facilities. All ANL-W facilities are within a local topographically closed basin. The surface of the facility slopes gradually from south to north, at approximately 30 ft per mile. Maximum topographic relief within the ANL-W administrative boundary is about 50 ft, ranging from 5,110 ft above mean sea level on the north boundary to 5,160 ft on a basalt ridge to the southeast.

The Twin Buttes are the most prominent topographic features within the INEEL and are found to the southwest of ANL-W. East and Middle Twin Buttes rise 1,100 and 800 ft, respectively, above the plain. Big Southern Butte, a composite acidic volcanic dome several miles south of the INEEL, is the most prominent single feature on the entire plain, rising approximately 2,500 ft above the level of the plain.

5.2 Meteorology

The U.S. Weather Bureau established a monitoring station at the Central Facilities Area (CFA) in 1949. A 250-ft tower is also located just outside the east security fence of the ANL-W area; however, this tower has not been in continuous operation for as long as the CFA station. The longest and most complete record of INEEL meteorological observations exists for the CFA weather station. Although meteorological conditions between the ANL-W and CFA facility are similar, the ANL-W site specific conditions were used.

5.2.1 Air Temperature

Data have been collected from both the two- and ten-meter above the ground surface at ANL-W. The two-meter data set is limited in time from August 1993 to the present. The record presented is considered typical of temperature conditions in the vicinity of the ANL-W facility. Although there is a much longer record available from the CFA station, the distance of ANL-W from that station precludes its use. Therefore, these data are presented here because they more accurately portray surface conditions at ANL-W. The maximum average monthly temperature during the time of record was 84.8°F for July and the minimum average monthly temperature of 7.9°F was recorded in December.

5.2.2 Precipitation

Precipitation is not measured at the ANL-W tower. However, the National Oceanic and Atmospheric Administration (NOAA) conducted an evaluation and the use of CFA data for these parameters is reasonable. Precipitation was measured as rainfall and snowfall for the period January 1950 to December 1988. During this period, most of the precipitation was received in May and June and averaged 1.2 inches, while the annual total average was 8.71 inches. As could be expected, most snowfall occurred during December and January. The monthly average snowfall event for December and January was 6.4 and 6.1 inches, respectively. Wet bulb temperature humidity measurements from CFA run from 1956 to 1961. The highest average occurred in the winter at 55%; a low average of 18% was recorded in the summer.

5.2.3 Evaporation and Infiltration

Although NOAA does not measure pan evaporation at the INEEL, adjusted Class A values have been made through regression analysis of other southeast Idaho sites. Data from 1950–51, 1958–59, 1963–64, and 1969–70 yielded an adjusted range of 40 to 46 inches per year. Other estimates for the INEEL have values of 36 inches per year from saturated ground, 32 to 36 inches per year from shallow lakes, and 6 to 9 inches per year from native vegetation. Evaporation rates calculated from the drop in level of the ANL-W Industrial Waste Pond (IWP) yield values between 0.85 and 0.14 inches per day for summer and winter, respectively. Infiltration as calculated by using the hydrologic equation (Equation 5.1 of *Water Supply and Pollution Control, Fourth* Edition) and solving for the infiltration term. This yields values for the IWP of between 0.48 to 0.004 inches per day for summer and winter, respectively.

5.2.4 Wind

Wind measurements at ANL-W are made at two and ten meters and the top of the tower (250 ft above the ground surface). From these data, ANL-W is clearly subject to the same southwest and northeast winds as the rest of the INEEL. Winds tend to be diurnal with up-slope winds (those out of the southwest) occurring during the day and down-slope winds (those out of the northeast) occurring at night. During the 5-year time of record at ANL-W from 1990 to 1994, winds blew from the southwest 14% of the time, from the south-southwest 11% of the time, and from the northeast 10% of the time. Winds were calm during only 2.49% of the time on record.

5.2.5 Special Phenomena

A thunderstorm is defined by the National Weather Service as a day on which thunder is heard at a given station. According to the definition, lightning, rain and/or hail are not required during this time. Following this strict definition, the ANL-W may experience two to three thunderstorm days from June to August. Thunderstorms have been observed during each month of the year, but only rarely from November to February. Thunderstorms on the INEEL tend to be less severe than in the surrounding mountains because of the high cloud base. In many instances, precipitation from a storm will evaporate before reaching the ground. Individual storms may, however, occasionally exceed long-term average rain amounts for a storm.

Local thunderstorms may also be accompanied by micro bursts. These micro bursts can produce dust storms and occasional wind damage. Thunderstorms may also be accompanied by both cloud-to-ground and cloud-to-cloud lightning.

Major range fires in the summer of 1995 and 1996 have burned most of the natural vegetation around the ANL-W facility. Reseeding efforts were conducted in the summer of 1996 to establish new growth in the areas upwind of the access road to ANL-W. It is not known at this time what long-range impacts these range fires have had with the flora and fauna around the ANL-W facility. Early indications have shown that the wet summer of 1997 has produced abundant small grasses that may decrease the heavy demand for food at other non-burned areas around ANL-W.

5.3 Geology

Much of the INEEL's surface is covered by Pleistocene and Holocene basalt flows. The second most prominent geologic feature is the flood plain of the Big Lost River. Alluvial sediments of Quaternary age occur in a band that extends across the INEEL from the southwest to the northeast. The alluvial deposits grade into lacustrine deposits in the northern portion of the INEEL, where the Big Lost River enters a series of playa lakes. Paleozoic sedimentary rocks make up a very small area of the INEEL along the northwest boundary. Three large silicic domes and a number of smaller basalt cinder cones occur on the INEEL and along the southern boundary.

5.3.1 Surface Geology

Surficial materials at ANL-W facilities are found within a topographically closed basin. Low ridges of basalt found east of the area rise as high as 100 feet above the level of the plain. Surficial sediments cover most of the underlying basalt, except where pressure ridges form basalt outcrops. Thickness of these surficial sediments ranges from zero to 20 feet (Northern Engineering and Testing, Inc. 1988).

Test borings at ANL-W have revealed two distinct layers in the surface sediments. The uppermost layer, from zero to several feet below land surface (BLS), consists of a light brown silty loam. The upper 1 to 2 feet. of this silty loam layer contains plant roots. This silty loam layer may also contain basalt fragments in areas where it directly overlies basalt.

The lower layer is a sandy-silt (loess) that extends to the underlying basalt. The loess of this layer was probably transported by wind from other parts of the plain. The windblown loess is calcareous and light buff to brown in color. Small discrete lenses of well-sorted sands that occur within the loess are probably the result of reworking by surface runoff into local depressions. The lower portion of this loess layer often contains basalt fragments of gravel to boulder size. The surface of the underlying basalt, whether it is in contact with the upper or lower layer, is highly irregular, weathered, and often very fractured.

5.3.2 Subsurface Geology

The subsurface lithology presented in this section is based on information gathered from past and recent borings around the ANL-W facility. Information gathered from recent borings (i.e., those drilled after 1992) have lead to a better understanding of the subsurface geology around ANL-W. The deep geology around ANL-W is dominated by basaltic lava flows. Minor discontinuous sedimentary interbeds occur at various depths, overlying the tops of basalt flows.

The subsurface geology at ANL-W is similar to that on the rest of the INEEL. The most striking difference is the lack of continuous sedimentary interbeds beneath the facility. Those sedimentary interbeds intercepted during drilling appear to be discontinuous stringers, deposited in low areas on basalt surfaces. These interbeds are generally composed of calcareous silt, sand, or cinders. Rubble layers between individual basalt flows are composed of sand and gravel to boulder sized material. The interbeds range in thickness from less than 1 inch to 15 feet. In 1988, drilling near the IWP an interbed was encountered between 40 to 50 feet BLS. This interbed is not continuous across the ANL-W area and does not appear west of the IWP. More aerially extensive interbeds have been identified above the regional water table, at approximately 400, 550, and 600 feet. BLS (Northern Engineering and Testing, Inc. 1988). The depth to the SRPA below the ANL-W facility is approximately 640 feet. BLS. The nature of these sedimentary interbeds and rubble zones does not appear to cause perching, but may retard the downward movement of water and produce preferred flow paths.

The thickness and texture of individual basalt lava flows are quite variable. Individual basalt flows range in thickness from 10 to 100 feet. The upper surfaces of the basalt flows are often irregular and contain many fractures and joints that may be filled with sediment. The existence of rubble zones at variable depths and extents are shown from caliper logs of hole diameter that reveal zones of blocky or loose basalt. Exposed fractures commonly have silt and clay infilling material. The outer portions of a flow (both top and bottom) tend to be highly vesicular. The middle portions of the flow typically have few vesicles and are dominated by vertical fractures formed during cooling.

The variability of basalt thickness and fracturing also plays an important role in well response to changes in the SRPA. This effect is most notable in well responses to barometric pressure changes. These responses to the barometric pressure changes result in groundwater elevation data that has to be corrected for barometric pressures in order to plot the contour of the water surface. Most of the wells at ANL-W act as water table wells with a rapid response to barometric fluctuations. However, wells ANL-MON-A-11 and the new well ANL-MON-A-14 are very slow to respond to barometric changes, often taking many hours to re-equilibrate to barometric shifts. Review of the driller's log for these wells shows that a thick, apparently massive basalt, rests just above the water table. This thick flow acts as a confining layer and restricts free air exchange near the well bore. Discussions with the INEEL field office of USGS suggest this is common on the INEEL and that the local area of such effects tends to be on the order of hundreds of feet. Neither the USGS nor ANL-W believes that this effect influences the wells' ability to intercept upgradient contaminants from the Leach Pit (ANL-08) and the Main Cooling

Tower Blowdown Ditch (ANL-01A). Furthermore, placement of the well away from the immediate downgradient edge of the source area allows for any lateral spreading of contaminants that may occur above this dense basalt before entry into the aquifer.

The sequence of interbedded basalt and sediments, discussed above, continues to well below the regional water table. The regional water table is typically encountered at an elevation of about 4,483 feet above mean sea level (MSL) near the ANL-W facility. A deep corehole was drilled in 1994 in an attempt to locate the effective base of the aquifer. This base is a layer below which the hydraulic conductivities drop by orders of magnitude. A large sedimentary interbed (up to 100 feet thick) and a marked change in the alteration of the basalts characterize the contact of the effective base. This contact was encountered at a depth of 1,795 feet below land surface (BLS) in the deep corehole at ANL-W. The sedimentary layer was approximately 15 feet thick.

5.4 Soils

The ANL-W site is located on a small meadow within a local drainage. The thickness of the surficial sediment in the vicinity of the ANL-W site is shown in Figure 5-1. These depths range from outcroppings at the surface to depths of 14 feet. In general, the depths of the surface soils above the basalt tend to increase from approximately 2 feet on the east side of the facility to a depth of 14 feet near the west side of the security fence.

The general soil types for the ANL-W facility are shown in Figure 5-2. The two types of soils shown in the figure for ANL-W are 425-Bondfarm-Rock outcrop-Grassy Butte complex and 432-Malm-Bondfarm-Matheson complex. As shown in the figure, the soil type 425-Bondfarm-Rock outcrop-Grassy Butte complex is found over all the sites in OU 9-04. This soil consists of 40% Bondfarm loamy sand, 30% rock outcrop, and 20% Grassy Butte loamy sand. The Bondfarm soil is found on the concave and convex side slopes and is surrounded by hummocky areas of the Grassy Butte soils. Rock outcrop is in the areas of slightly higher than areas of Bondfarm soils. Also included in this complex are about 10% Matheson loamy sand, a soil that is similar to the Grassy butte soils but that is less than 40 inches deep to bedrock, and Terreton loamy sand. The Bondfarm soil is shallow and well drained. It formed from eolian material. Typically, the surface layer is light brownish gray loamy sand about 4 inches thick. The subsoil and substratum are very pale brown sandy loam 14 inches thick. Basalt is at a depth of 18 inches. The soil is calcareous throughout and may have a layer of lime accumulation at depth. The permeability of the soil is moderately rapid. Effective rooting depth is 10 to 20 inches. Available water capacity is low. Surface runoff is slow or medium, and the hazard of erosion is slight or moderate. The hazard of vegetated soil blowing is very slight.

Rock outcrop consists of exposed basalt rock. Crevices in the rock contain some soil material that supports a sparse stand of grasses, forbs, and shrubs. While, the Grassy Butte soil is very deep and somewhat excessively drained. It formed in sandy eolian material. The underlying material to the depth of 60 inches or more is grayish brown and gray loamy sand. The soil is calcareous throughout and has a layer of lime accumulation at a depth of 19 inches. The permeability of the soil is rapid. Effective rooting depth is 60 inches or more, and the available water capacity is low or moderate. Surface runoff is very slow or slow. The hazard of vegetated soil blowing is very high.

5.5 Hydrogeology

Recharge to the SRPA in the vicinity of ANL-W occurs as snowmelt or rain. During rapid snowmelt in the spring, moderate recharge to the aquifer can occur. However, high evapotranspiration rates during the summer and early fall prevents significant infiltration from rainfall during this period. Because of the distance from the surrounding mountains and permanent surface water features (i.e., the Big Lost River), the SRPA beneath ANL-W is unaffected by underflow or recharge from these sources.

No permanent, natural surface water features exist near the ANL-W site. The existing surface water features (e.g., drainage ditches and discharge ponds) were constructed for ANL-W operations for the collection of intermittent surface runoff. A natural drainage channel has been altered to discharge to the Industrial Waste Pond via the Interceptor Canal. Under the unusual conditions when the air temperature has been warm enough to cause snow-melt, but the ground has remained frozen, precluding infiltration, surface runoff along this channel has discharged to the Industrial Waste Pond. This condition most recently occurred during the spring of 1995. During this time, flow was visible from the surrounding basin into the Industrial Waste Pond for approximately 4 days. However, at no time did any water discharge from the pond to the downstream channel. Before 1995, the most recent occurrence of this situation was in 1976.

Perched water is defined as a discontinuous saturated lens with unsaturated conditions existing both above and below the lens. Classical conceptualization of a perched water body implies a large, continuous zone of saturation capable of producing some amount of water. These perched zones can occur over dense basalts that exhibit low hydraulic conductivity in addition to sediment interbeds that have low permeability. It is unknown which conceptual model is more prevalent at the INEEL. However, in the subsurface basalts at ANL-W, the "perched water" appears as small, localized zones of saturated conditions above some interbeds and within basalt fractures, which are incapable of producing any significant amount of water.

5.5.1 Snake River Plain Aquifer

Estimates show that nearly 2×10^9 acre-feet of water exist in the SRPA with water usage within the boundaries of the INEEL being approximately 5.6×10^3 acre-feet per year. From 1979 to 1994, the ANL-W withdrew an average of 138 million gallons of water per year from the SRPA. Principal uses of the water are for plant cooling water operations, boiler water, and potable water. On average, 85% of the water is discharged to either the sanitary Sewage Lagoons (ANL-04) or Industrial Waste Pond (ANL-01), 13% is discharged to the air via cooling towers, and 2% is discharged to subsurface septic systems.

Regional flow in the SRPA is from northeast to southwest. Depth to the SRPA near the ANL-W facility is approximately 640 feet BLS, based on 1995 water level measurements. Transmissivities of the SRPA range from 29,000 to 556,000 feet squared per day, based on aquifer test data from two production wells at the ANL-W. Figure 5-3 shows the location of monitoring wells near the ANL-W facility, hydraulic gradient, and the groundwater flow direction.

5.5.2 Surface Water Hydrology

Most of the INEEL is located in a topographically closed drainage basin, commonly referred to as the Pioneer Basin, into which the Big Lost River, Little Lost River, and Birch Creek may drain. As

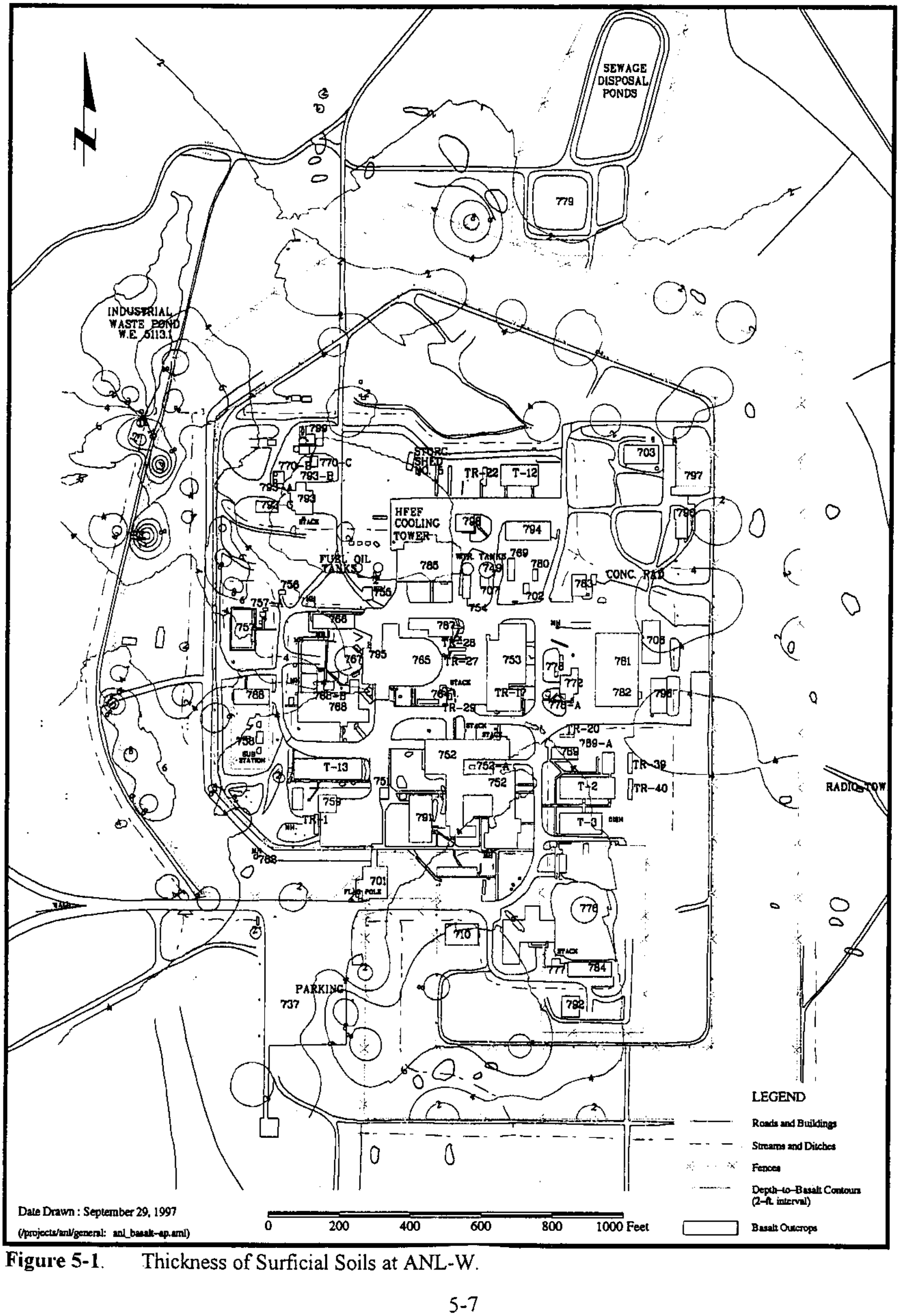

Figure 5-1. Thickness of Surficial Soils at ANL-W.

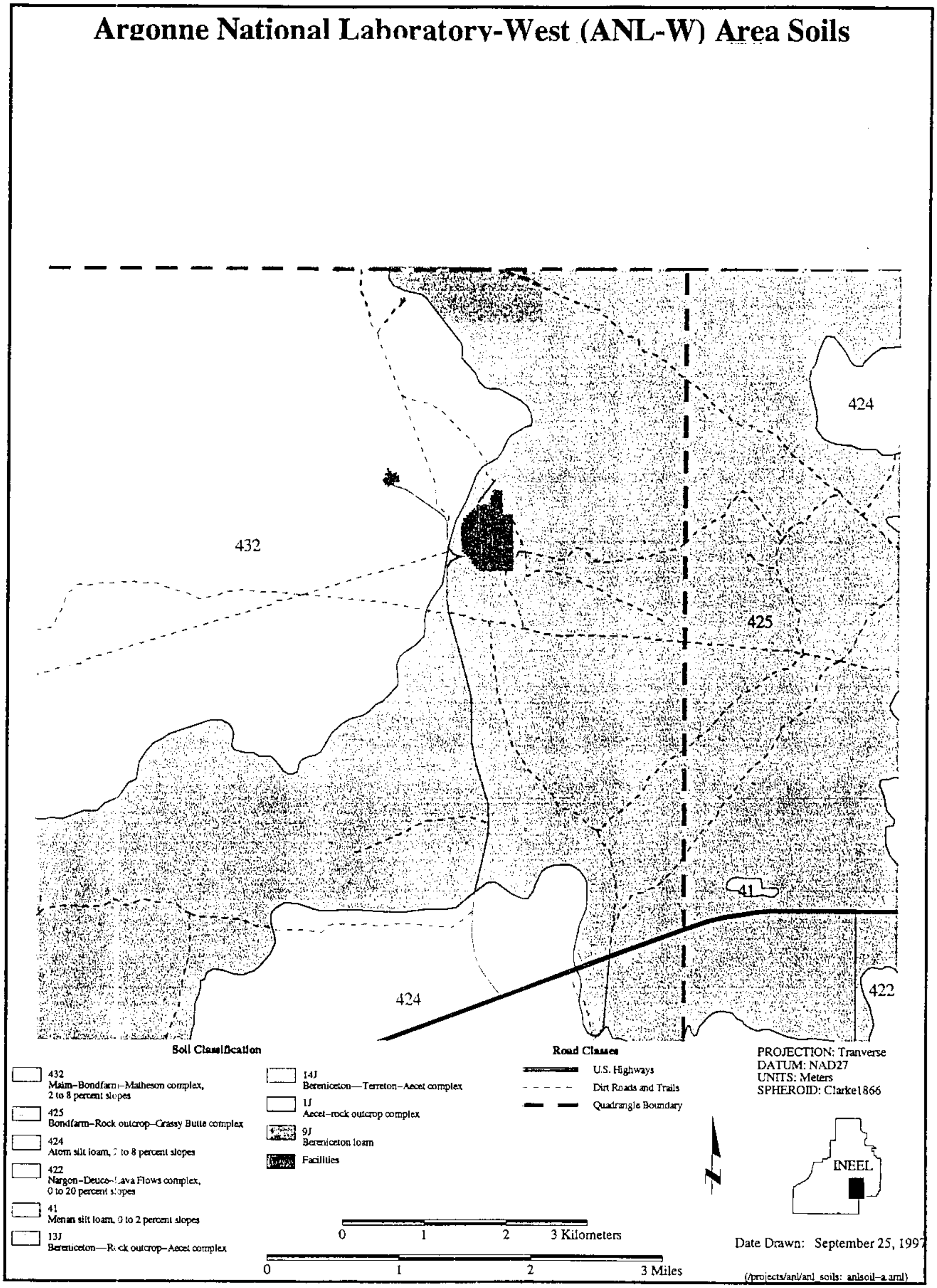

Figure 5-2. Map Showing General Soil Types Near ANL-W.

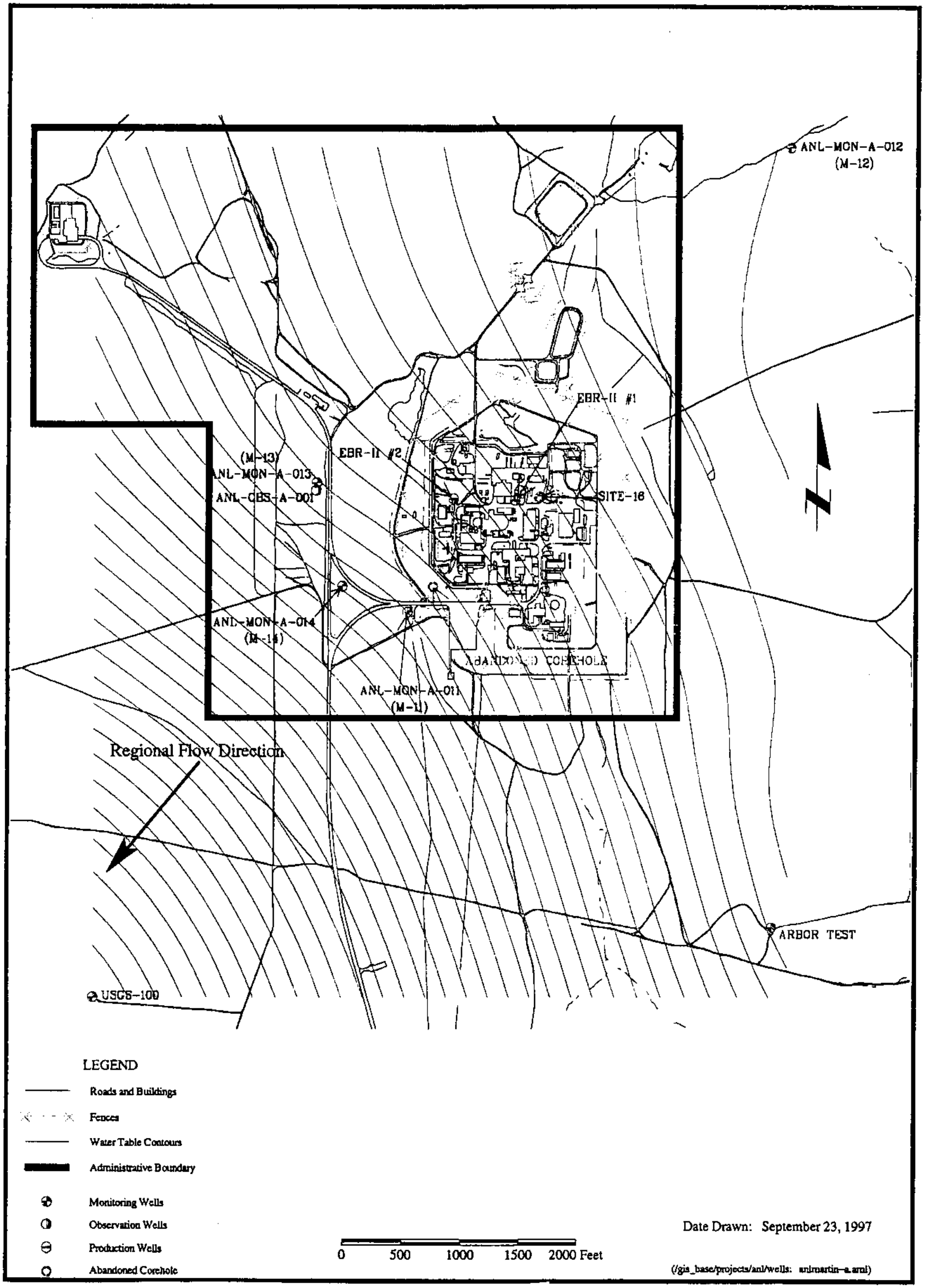

Figure 5-3. Location of Monitoring Wells Near ANL-W.

shown in Figure 2-1, these streams drain mountain watersheds to the north and west of the INEEL, including the Pioneer, Lost River, Lemhi, and Centennial mountain ranges. Land surface elevations rise from 4,774 feet in the basin to 12,656 feet on Borah Peak in the Lost River Range (Bennett 1990). Rainfall and snowmelt within the upper basin contribute to surface water, mainly during spring.

Most of the water in these streams is diverted upstream of the INEEL for irrigation or is lost to the subsurface due to high infiltration rates in the channel bed. During periods of high flow, some surface water may reach the INEEL. This water is approximately 15 miles west of the ANL-W facility. Because there are no permanent, natural surface water features near ANL-W, flooding is not a major concern. During rapid snowmelt events at ANL-W the Interceptor Canal and the Industrial Waste Pond receive surface water runoff. There is a diversion dam constructed south of the facility to handle these events. This dam has a headgate that, when closed, diverts water into the adjacent drainage ditch and eventually to the Interceptor Canal (ANL-09), and from there directly into the Industrial Waste Pond (ANL-01). No surface outflow leaves the INEEL, except for minor local slope runoff.

5.6 Ecology

The INEEL is located in a cool desert ecosystem characterized by shrub-steppe vegetation communities typical of the northern Great Basin and Columbia Plateau Region. The surface of the INEEL is relatively flat, with several prominent volcanic buttes and numerous basalt flows that provide important habitat for small and large mammals, reptiles, and some raptors. Juniper woodlands occur near the buttes and in the northwest portion of the INEEL; these woodlands provide important habitat for raptors and large mammals. Limited riparian communities exist along intermittently flowing waters of the Big Lost River and Birch Creek drainages.

Wildlife species present in and around ANL-W include birds, mammals, and reptiles that are associated with facilities, sagebrush-steppe, rock outcroppings, deciduous trees and shrubs, grasslands, and water (e.g., Industrial Waste Pond, Sewage Lagoons, and drainage ditches). Both terrestrial and aquatic species are potentially present. Sagebrush communities surrounding ANL-W typically support a number of species including sage grouse (*Centrocercus urophasianus*), sage sparrow (*Amphispiza belli*), and pronghorn (*Antilocapra americana*). Rock outcroppings associated with these communities also provide habitat for species such as bats, woodrats (*Neotoma cinerea*), and sensitive species such as the pygmy rabbit (*Brachylagus idahoensis*). Nearby grasslands serve as habitat for species including the western meadowlark (*Sturnella neglecta*) and mule deer (*Odocoileus hemionus*). ANL-W facility structures also provide important wildlife habitat. Buildings, lawns, ornamental vegetation, and ponds are utilized by a number of species such as waterfowl, raptors, rabbits, and bats. Lawns can be an important resource to species at WAG 9 (the source of the water for these lawns is from the ANL-W deep wells). No surface hydrology has existed to support fish. Current and future aquatic invertebrates are, however, supported by habitat provided by the Sewage Lagoons and the Industrial Waste Pond while they are receiving wastewaters from the facility.

The WAG 9 screening-level ecological risk assessment (SLERA) has also been conducted. The plant oxytheca (*Oxytheca dendroidea)* typically supports a number of species including sage grouse which was listed as a sensitive species with the U.S. Bureau of Land Management and the Idaho Native Plant Society/Idaho Fish and Game Conservation Data Center. Recently, the Environmental Science and Research Foundation conducted and published a biological assessment for WAG 9, which was organized by species groups and published.

5.7 Nature and Extent of Contamination

The following sections describe the nature and extent of contamination for the WAG 9 sites that were retained for evaluation in the OU 9-04 Comprehensive RI/FS after completion of the Track 1 or Track 2 evaluation, and screening against the INEEL 95% upper confidence level (95% UCL) of background soil concentrations. The complete evaluation of the groundwater and the soils investigation is found in the OU 9-04 Comprehensive RI/FS. Only a brief summary of each is included in this ROD.

5.7.1 Nature and Extent of Groundwater Contamination

The GWSCREEN model (Rood 1994) was selected to perform the groundwater fate and transport calculations for contaminants at ANL-W. The model was designed to perform groundwater pathway screening calculations for the Track 1 and Track 2 process. It was also an appropriate model to use when site characterization data are lacking and little would be gained by the use of a more complex model.

A receptor grid was overlain on the source areas such that contributions to contaminant concentrations from all retained sites could be calculated at each receptor node. Each source area was modeled either as surface, buried sources, or pond as described in the GWSCREEN user's manual. Prior to modeling the groundwater exposure pathway, soil contamination data for each site was screened to eliminate low-risk contaminants and minimize the modeling input. Two inorganics, arsenic and chromium were retained as contaminants of potential concern. The groundwater concentrations for each of the retained sites were determined along with the cumulative effects of the overlapping plumes for similar contaminants from more than one release site. These groundwater concentrations for arsenic and chromium were then used to determine the associated human health risks of using the groundwater. Of all the potential contaminants of concern at the ANL-W facility, all of the contaminants including the arsenic and chromium were screened as contaminants of potential concern during the risk assessment. Thus, there is no nature and extent of groundwater contamination at ANL-W since no detrimental effects to the groundwater have occurred or are modeled to occur at the ANL-W facility from the contaminants identified during the evaluation of the CERCLA sites.

5.7.2 Nature and Extent of Soil Contamination

All of the 37 FFA/CO sites at WAG 9 were evaluated as part of the OU 9-04 Comprehensive RI/FS. The site screening was conducted using a four step process. The first step was to review all the information on a particular site to make sure no contaminant was overlooked. The second step was to identify any new sites or unevaluated sites. The third step was to eliminate sites that were found to be No Action based on the results of either the Track 1 or Track 2 assessment. The fourth step was to eliminate sites that had no source (i.e., no contaminants above 95% UCL of INEEL background). The result of the screening process resulted in thirty sites being screened from the detailed risk assessment process. The seven sites that were retained are: the Sanitary Sewage Lagoons (ANL-04), the EBR-II Leach Pit (ANL-08), the Industrial Waste Pond and Ditches A, B, and C (ANL-01), the Main Cooling Tower Blowdown Ditch (ANL-01A), the Interceptor Canal (ANL-09), the Industrial Waste Discharge Ditch (ANL-35), and the Main Cooling Tower Riser Pits (ANL-53).

Two of these seven WAG 9 sites were subdivided into smaller areas to facilitate a more accurate risk assessment based on actual physical characteristics, and water discharge rates. These two sites are the Interceptor Canal and the Industrial Waste Pond and Ditches A, B, and C. The Interceptor Canal was divided into two areas, the Interceptor Canal-Canal and -Mound areas. While the Industrial Waste Pond and associated Ditches A, B, and C has been subdivided into four areas the Industrial Waste Pond, Ditch A, Ditch B, and Ditch C. Thus, eleven areas were evaluated in the OU 9-04 Comprehensive RI/FS. The nature and extent of contamination in these eleven areas is described in sections 5.7.2.1 through 5.7.2.11 These eleven sites that were retained for evaluation in the OU 9-04 Comrehensive RI/FS are shown in Figure 5-4.

Appendix A of the Operable Unit 9-04 Comprehensive RI/FS contains all of the sampling information on these sites including: sample location maps, color concentration profiles, contaminant of concern statistics including sample size, mean, maximum, and 95% upper confidence limit (UCL) concentrations. Table 5-1 shows a summary of the FFA/CO site, the subarea, extent of contamination, contaminant of potential concern (COPC), and 95% UCL for the COPC for the eleven sites that were retained for evaluation in the OU 9-04 Comprehensive RI/FS.

Table 5-1. Extent of Contamination Soil in WAG 9 Sites Retained for Cleanup.

FFA/CO Site	Area Name	Width (ft)	Length (ft)	Depth (ft)	COPC	Conc. (mg/kg or pci/g)
ANL-01	Industrial Waste Pond	200	250	0.5	Cs-137	29.2
					Cr+3	10,260
					Hg	2.62
					Se	8.41
					Zn	5012
ANL-01	Ditch A	5	400	0.5	Hg	3.94
ANL-01	Ditch B	5	1,400	1.3	Cr+3	1,170
					Zn	3,020
ANL-01	Ditch C	5	500	2.5	Hg	0.29
ANL-01A	Main Cooling Tower Blowdown Ditch	6	700	2	Cr+3	709
					Hg	8.83
ANL-04	Sewage Lagoons	300	700	1	Hg	3.2
ANL-08	EBR-II Leach Pit					
ANL-09	Interceptor Canal-Canal	30	1,425	6	Cs-137	18
ANL-09	Interceptor Canal-Mound	20	500	4	Cs-137	30.53
ANL-35	Industrial Waste Lift Station Discharge Ditch	4	500	1	Ag	352
ANL-53	Main Cooling Tower Riser Pits	6	10	1.5	As	76
					Cr+3	1,717
					Pb	4,725
					Hg	0.78

5.7.2.1 Industrial Waste Pond

The Industrial Waste Pond (ANL-01) is an unlined, approximately 1.2-ha (3-acre) evaporative seepage pond fed by the Interceptor Canal and site drainage ditches. The pond was excavated in 1959, obtained a maximum water depth of about 4 m (13 ft) in 1988, and is still in use today. During this time, the Cooling Tower Blowdown ditches have been rerouted several times. ANL-W auxiliary cooling tower blowdown ditches convey industrial wastewater from the EBR-II Power Plant and the Fire Station (Bldgs. 768 and 759) to the Industrial Waste Pond. The Industrial Waste Pond was originally included with the Main Cooling Tower Blowdown Ditch (ANL-01A) as a Land Disposal Unit under the RCRA Consent Order and Compliance Agreement on the basis of potentially corrosive liquid wastes discharged with the cooling tower effluent. However, ANL-W conducted a field demonstration with the EPA and State of Idaho representatives in attendance in July 1988 that showed that any potentially corrosive wastes discharged to the Industrial Waste Pond were naturally neutralized in the Main Cooling Tower Blowdown Ditch before reaching the Industrial Waste Pond. On that basis, EPA removed the Industrial Waste Pond as a Land Disposal Unit and re-designated it as a Solid Waste Management Unit. Therefore, this site is still under the regulatory authority of RCRA in addition to being on the FFA/CO and under the regulatory authority of CERCLA.

DOE anticipates that the Industrial Waste Pond will continue to be used for storm water disposal as well as future releases of liquid cooling water discharges from the Sodium Process Facility. The Sodium Process Facility cooling water discharges will average 100 gallons per minute and are anticipated to last for three years starting in the spring of 1998 and lasting until summer of 2002. These cooling water releases will be discharged to the surface drainage ditch on the North side of ANL-W and drain approximately 250 ft. west to the Industrial Waste Pond. The Sodium Process Facility is a permitted HWMA/RCRA facility and is scheduled for clean closure under RCRA.

Appendix A of the OU 9-04 Comprehensive RI/FS shows the sampling location plan map and the statistics for contaminant of concern (COC) by pathway for all samples collected from the Industrial Waste Pond. Soil and sediment samples were collected from the Industrial Waste Pond as part of four different investigations occurring from 1986 to 1994. Cesium-137 was retained as a COPC for humans while, four inorganic contaminants were retained as COPCs for the ecological receptors.

The cesium-137 and the four inorganics (trivalent chromium, mercury, selenium, and zinc) were present in the southern and eastern part of the Industrial Waste Pond with concentrations typically greatest for surface samples near the inlet pipe in the southern part of the Industrial Waste Pond . Samples were screened against the 95% UCL concentrations for grab samples at the INEEL and will be referred to as 95% UCL background. The highest number of metals above the 95% UCL background concentration were collected from location #101 with 11 metals exceeding background, then location # 97 with ten metals exceeding the 95% UCL background concentration. The maximum cesium-137 concentration was 57.91 pCi/g, while the 95% UCL concentration was 29.2 pCi/g. For the trivalent chromium, mercury, selenium, and zinc the maximum concentrations were 11,400, 6.8, 37.9, and 5,850

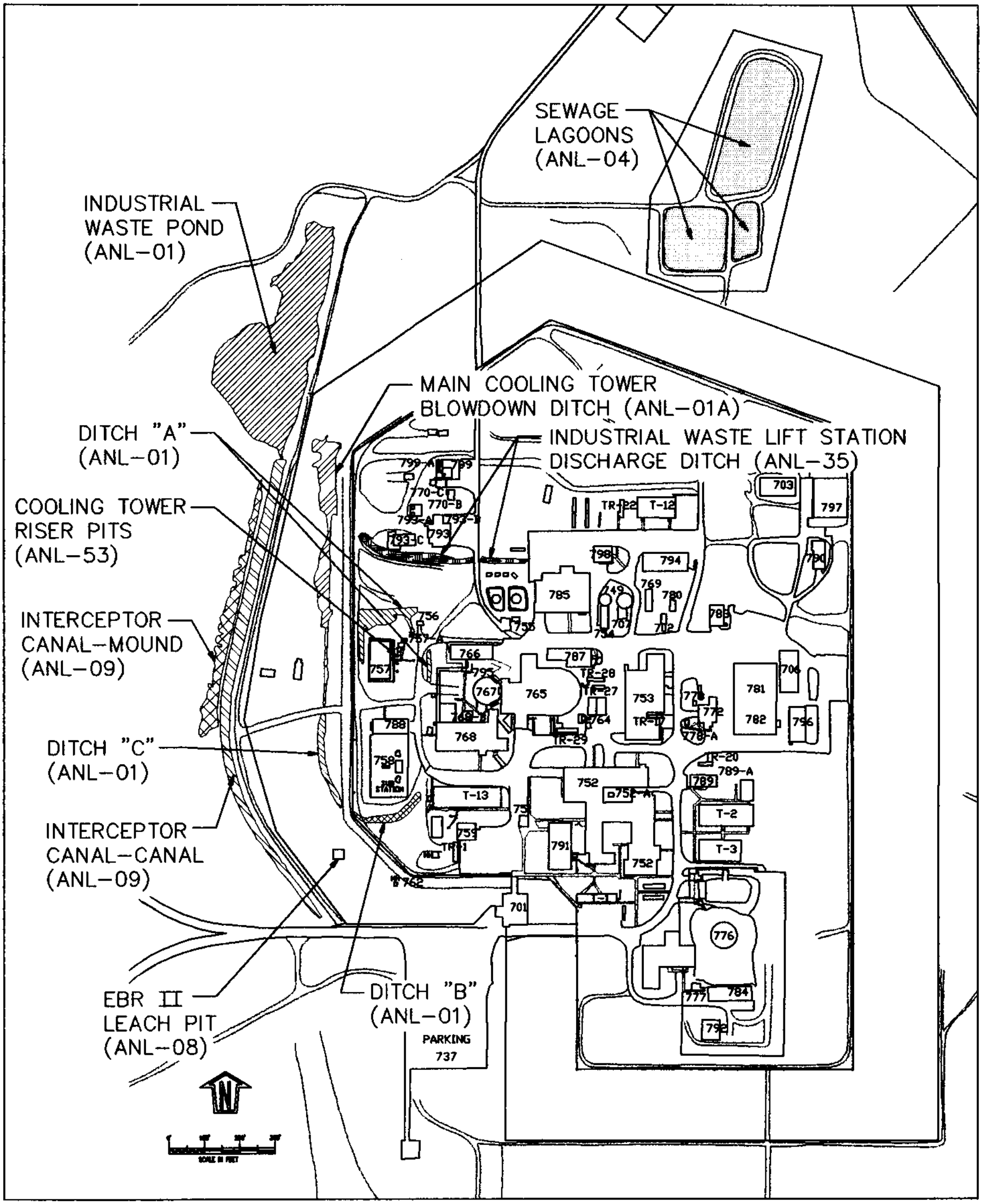

Figure 5-4. Eleven Areas Retained for Evaluation in RI/FS.

mg/kg and the UCL values were 1,30, 2.62, 8.41, and 8.41 mg/kg, respectively. Therefore, the horizontal extent of contamination is the dimensions of both the southern and eastern part of the Industrial Waste Pond 200 feet wide and 250 feet long. While, the vertical extent of contamination is in the upper 0.5 feet of sediments in the Industrial Waste Pond.

5.7.2.2 Ditch A

Ditch A conveyed industrial wastewater from the EBR-II Power Plant auxiliary cooling tower to the Industrial Waste Pond. Ditch A is still being used today to transport storm water runoff as well as intermittent auxiliary cooling tower waters. Discharges to Ditch A flow into the Main Cooling Tower Blowdown Ditch and ultimately into the Industrial Waste Pond.

Soil samples were collected from Ditch A as part of two different investigations. These studies are the Chen Northern in 1988 and the 1994 ANL-W study. Appendix A of the OU 9-04 Comprehensive RI/FS shows the sampling location plan map, color intensity profile maps, and statistics for COC by pathway. In the 1988 Chen Northern study, eight soil samples were collected from three locations in the western part of the ditch. In the 1994 ANL-W study, 30 soil samples were collected from 11 locations throughout the entire length of the ditch.

Mercury was retained as a COPC for ecological receptors and was detected in 74% (27/38) of the samples analyzed. All of the mercury detections exceeded the upper limit of the 95% UCL background concentration (0.074 mg/kg). The source of the mercury is most likely from mercuric chloride used as a wood preservative in the cooling tower or from a neutron absorber in the power plant which is being decommissioned. The maximum detected concentration of 4.1 mg/kg was detected at location #10W in the surface sample (0 to 6 inches). While, the UCL concentration for mercury in Ditch A was 3.94 mg/kg. In all but one instance, the surface samples at each location contained the highest concentrations of mercury with the exception of #26E. The mercury contamination in Ditch A is spread through the entire length with the highest concentrations near the intersection of the Main Cooling Tower Blowdown Ditch and Ditch A. The mercury concentrations also decrease with increasing depth with the highest concentrations in the surface 0 to 6 inch samples. Therefore, the extent of contamination is the dimensions of both the eastern and western part of Ditch A 5 feet wide and 400 feet long and the vertical extent contained to the surface soils 0 to 6 inches.

5.7.2.3 Ditch B

Ditch B was also used to transport storm water runoff as well as wastewater from the EBR-II Power Plant and the Fire Station (Bldgs. 768 and 759) to the Industrial Waste Pond. Only a small 125 feet portion of Ditch B is still being used today since the majority 1,275 feet of Ditch B was backfilled with clean soil to grade approximately 5-feet during the installation of a secondary security fence.

Soil samples were collected from Ditch B as part of three different investigations. Six soil samples were collected from the 1988 DOE study, 15 samples collected from the 1988 Chen-Northern study, and 10 samples in the 1994 ANL-W study. Appendix A of the OU 9-04 Comprehensive RI/FS shows the sampling location plan map, color intensity profile maps, and statistics for COC by pathway for the 1994 samples collected from Ditch B. The contaminant screening resulted in COPCs for humans and only two inorganics being retained as COPCs for the ecological receptors. These two inorganics are trivalent chromium and zinc. The extent of the inorganic contaminants are discussed below.

The contaminants in the covered portion of Ditch B have been screened from the risk assessment since the pathway was eliminated when the area was backfilled with clean soils. The open portion of Ditch B has chromium and zinc at concentrations that could pose unacceptable human and ecological risks. The maximum concentration of trivalent chromium and zinc are 4,530 and 3,020 mg/kg and the UCL concentrations are 1,306 and 1,460 mg/kg, respectively. The extent of the inorganic contaminants span the entire length of the open portion of Ditch B is 5 feet wide and 125 feet long. No stratification of inorganics was determined from the results in that portion of Ditch B and thus the total depth of the alluvium to the basalt of 0 to 1.3 feet is used to define the extent of contamination.

5.7.2.4 Ditch C

The Ditch C portion of the Industrial Waste Pond and associated ditches (ANL-01) was created in 1978 when a portion of Ditch B was backfilled. The water in Ditch C is the same as that in Ditch B mentioned in previous section. The discharge water going to Ditch B is rerouted via culvert under the security fence to Ditch C which drains to the Main Cooling Tower Blowdown Ditch and ultimately the Industrial Waste Pond. Ditch C is dimensions are approximately 5 x 500 x 2.5 feet deep. The contaminant screening resulted in mercury being retained as a COPC for the ecological receptors. The maximum mercury concentration was 0.83 mg/kg and the 95% UCL concentration was determined to be 0.29 mg/kg. The extent of the contamination was spread throughout the entire length of the ditch (5 x 500 feet) and the vertical extent of contamination was 2.5 feet deep.

5.7.2.5 Main Cooling Tower Blowdown Ditch

The Main Cooling Tower Blowdown Ditch (ANL-01A) runs north on the westside of the Main Cooling Tower and then north between the security fences to the Industrial Waste Pond. It is an unlined channel approximately 700 feet in length and 3 to 15 feet wide. From 1962 to 1996, the ditch had been utilized to convey industrial wastewater from the Cooling Tower to the Industrial Waste Pond. The main source of impurities to the Industrial Waste Pond were water treatment chemicals used for the regeneration of backwash waters from the ion exchange resin beds and remove minerals from cooling tower water used in the EBR-II steam system. From 1962 to July 1980, a chromate-based corrosion inhibitor was added to the Cooling Tower water and the blowdown contained significant quantities of hexavalent chromium. Ion exchange column regeneration discharges have occurred from 1962 to March 1986. Regeneration of these column is accomplished with sulfuric acid for cation columns and sodium hydroxide for anion columns.

In January 1986, a pH measurement of 1.86 was measured in the effluent discharged to the Main Cooling Tower Blowdown Ditch. This classified the liquid wastes as corrosive according to 40 CFR 261.22. The site was then classified as a Land Disposal Unit under RCRA. A temporary neutralization system was installed in March, and a permanent neutralization tank was installed in October 1986. A few discharges of regeneration water occurred, but they were in small batches and were monitored before discharge. Since October 1986, after the neutralization tank was installed, reagents are being neutralized in a tank prior to discharge to the ditch. DOE, along with EPA and IDHW WAG 9 managers, have determined that the Main Cooling Tower Blowdown Ditch is a RCRA Land Disposal Unit and will be remediated under the CERCLA process in accordance with the applicable substantive requirements of RCRA/Hazardous Waste Management Act (HWMA), if an unacceptable risk to human health or the environment. However, the FFA/CO has only adopted RCRA corrective action (3004 (u) & (v)), and not RCRA/HWMA closure. Therefor, upon completion of the remedial action, the DOE must receive approval from the IDHW Department of Environmental Quality director that the Main Cooling Tower Blowdown Ditch has been closed pursuant to RCRA/HWMA closure requirements.

Appendix A of the OU 9-04 Comprehensive RI/FS shows the sampling location plan map, color intensity profile maps, and statistics for COC by pathway for samples collected from the Main Cooling Tower Blowdown Ditch. Soil samples were collected from the Main Cooling Tower Blowdown Ditch as part of four different investigations occurring from 1987 to 1994. In 1987, one soil sample (EST-SED) was collected from the northern part of the ditch where a storm water discharge ditch flows into it. In 1988, four soil samples were collected from the different parts of the ditch. Three soil samples were collected from the west part of the ditch (C103B-S, C100B-S,D, and C73A-S), one sample was collected in the eastern portion of the ditch at the discharge point (B6B-S,D). In 1989, two soil samples (M-8 and M-10) were collected in the 145-foot interbed along the western portion of the ditch. Finally, in 1994, 35 samples were collected along the entire length of the ditch. The contaminant screening resulted in two inorganics; trivalent chromium and mercury at levels high enough be retained as a COPC for the ecological receptors.

Chromium concentrations were the highest in the outfall from the Cooling Tower. But, the entire length of the Main Cooling Tower Blowdown Ditch has concentrations of chromium above the 95% UCL background concentration levels for the INEEL surface soils. The analysis performed on the chromium was for the total chromium analysis. The chromium was release was almost exclusively in the trivalent form rather than the more toxic hexavalent form. But, to be conservative, DOE assumed that ten percent of the total chromium would be in the more toxic hexavalent form. The chromium concentrations almost exclusively decreased with increasing depth, and also decreased with increasing distance downstream of the cooling tower outfall. The maximum chromium concentration was 2,200 mg/kg and the UCL concentration was 1,306 mg/kg for the Main Cooling Tower Blowdown Ditch.

Forty-eight percent (22/46) of the mercury concentrations exceeded the upper limit of the 95% UCL background concentration (0.074 mg/kg) ranging from 0.08–13.4 mg/kg. The highest detected concentration was from the surface sample at location 9E. Mercury concentrations were highest in the eastern part of the ditch and typically decreased to less than one mg/kg in the subsurface samples except for one location. At location 11E, mercury concentrations were 2.8 mg/kg in the surface and 2.3 mg/kg in the subsurface sample. The maximum mercury concentration was 13.4 mg/kg and the UCL concentration was 8.83 mg/kg for the surface soils in the Main Cooling Tower Blowdown Ditch.

The extent of the contamination is mainly concentrated in the southern portion of the ditch near the cooling tower outfall. However, there are some concentrations greater than the upper limit of the 95% UCL background concentration for some metals in the northwestern part of the ditch. Therefore, the horizontal extent of contamination is the dimensions of both the eastern and western part of the Main Cooling Tower Blowdown Ditch 3 to 15 feet wide and 700 feet long. Because the width of the ditch varies from 3 to 15 feet, an average width of 6 feet will be used. The majority of the inorganic contaminants were concentrated in the top 6 inches of soils. However, some detections greater than the upper limit of the 95% UCL background concentration were made in some subsurface samples. Therefore, the vertical extent of contamination is assumed to be one-half the average depth to basalt 2 feet.

5.7.2.6 Sewage Lagoons

The sanitary Sewage Lagoons (ANL-04) are located at the Sanitary Sewage Treatment Facility, north of the ANL-W facility. Two lagoons were constructed in 1965, with a third built later in 1974. According to engineering drawings, the three sanitary sewage lagoons cover approximately two acres. Appendix B shows a figure of the three lagoons with dimensions of; (1) 150 × 150 × 7 feet, (2) 50 × 100 × 7 feet, and (3) 125 × 400 × 7 feet. The lagoons receive all sanitary waste waters originating at ANL-W, with the exception of the Transient Reactor Test Facility, Sodium Process Facility, and the Sodium Components Maintenance Shop. Sanitary waste discharged is from rest rooms, change facilities, drinking fountains, and the Cafeteria. The three lagoon bottoms are sealed with a 0.125 to 0.25-inch layer of bentonite and are situated approximately 640 feet above the groundwater. The Sewage Lagoons are still in use and will continue to be used for disposal of sanitary wastes for the next 35 years.

Between 1975 and 1981, photo processing solutions were discharged from the Fuel Assembly and Storage Building to the Sanitary Waste Lift Station, which discharges to the Sewage Lagoons. There has been no known radioactive or hazardous substances released into the Sewage Lagoons. Periodic sampling of the Sewage Lagoon and the radionuclide detector placed in the lift station (Sanitary Waste Lift Station-788) supplying the Sewage Lagoons document that no radioactive substances have been released.

The results of the contaminant screening indicated that one contaminant, mercury, should be retained as a COPC for the ecological receptors. The mercury concentrations were detected throughout all of the sludge 0 to 6 inch samples in the Sanitary Lagoons. The maximum mercury concentration in the Sewage Lagoons was 3.2 mg/kg and this value was used in place of the UCL concentration because of the small data set (eight samples).

5.7.2.7 EBR-II Leach Pit

The EBR-II Leach Pit is located between the inner and outer security fences in the southwest corner of the ANL-W facility. The Leach Pit was an irregularly shaped, unlined underground basin that was excavated with explosives into basalt bedrock in 1959. The Leach Pit was used to dispose of ANL-W liquid industrial waste including cooling tower blowdown, sanitary effluent, cooling condensates, and radioactive effluent, until 1973. The average annual discharge to the Leach Pit was approximately 9×10^4 gallons from 1960 to October 1973 containing a total of 10.4 curies of radioactivity. The majority of the sludge was removed during an interim action in December 1993, after which the bottom of the Leach Pit was lined with 5 to 7 cm (2 to 3 in.) of bentonite clay and backfilled to grade. The contaminant screening resulted in various radionuclides being retained for evaluation of the groundwater pathways for the human health risk assessment and no COPCs being retained for the ecological receptors.

The extent of the radionuclide contamination was the physical dimensions of the EBR-II Leach Pit since it was blasted into the basalt. The extent of the EBR-II Leach Pit is 18 x 40 x 0.1 feet since the sludge was removed in 1993 and no horizontal or vertical migration has been detected in coring and drilling activities around and through the Leach Pit. The predominant radionuclides retained are cesium-137, strontium-90, cobalt-60, and uranium-238.

5.7.2.8 Interceptor Canal-Canal

The canal portion was utilized to transport industrial waste to the Industrial Waste Pond and to divert spring runoff and other natural waters around the ANL-W facility for flood control. Between 1962 and 1975, two 4-in. pipes transported liquid industrial wastes and cooling tower effluent, to the Interceptor Canal. One line transported cooling tower blowdown water and regeneration effluent while the other line originated at the Industrial Waste Lift Station (Bldg. 760) and transported industrial wastes. Liquid radioactive wastes were discharged through the same line as the industrial wastes, but they were diverted to the EBR-II Leach Pit. Discharge of industrial wastes was discontinued in 1973, and discharge of cooling tower blowdown water was discontinued in 1975.

During clean out operations at the Interceptor Canal in October 1969, abnormal background radioactivity was detected. Additional radiation surveys in 1969, 1973, and 1975 indicated that the entire length of the Interceptor Canal was contaminated. Approximately 4,540 yd^3 of contaminated soil was identified and only 1,240 yd^3 was targeted for removal. Of this soil that was removed, approximately 182 yd^3 was disposed at the RWMC from 1975 to 1976, and remaining 1,058 yd^3 of contaminated soil was removed and stockpiled on site (this stockpiled soil was evaluated as part of the OU 10-06). The remaining soil, 3,300 yd^3 was left in the ANL-09-Mound and was investigated as part of the RI/FS process. Another survey conducted in 1993 indicated that two small areas had elevated readings above background.

The contaminant screening resulted in only cesium-137 being retained as a COPC for humans and no COPCs for the ecological receptors. The 95% UCL concentration for cesium-137 is 18 pCi/g and is fairly uniform throughout the entire length of the ditch. Thus, the extent of contamination is 30 x 1,425 x 6 feet.

5.7.2.9 Interceptor Canal-Mound

This section summarizes the analytical results for soil samples collected at the Interceptor Canal-Mound (ANL-09) area. The Interceptor Canal-Mound was formed when 1,384 m^3 (1,810 yd^3) of dredged material was placed on the bank of the Interceptor Canal. Soil samples from the Interceptor Canal Mound were only analyzed for radionuclides. Inorganic releases to the Interceptor Canal-Canal occurred after the canal was dredged and therefore would not be in the dredged piles. Surface soil samples 0 to 6 inches and a subsurface soil sample approximately 3 to 4 feet were collected at the ANL-09-Mound area. In addition, another subsurface soil sample was collected from approximately 5 to 6 feet at three sample locations (#356, #368, and #378). Subsurface soil samples were collected at a depth that corresponds to the bottom of the mound. The deeper subsurface samples were collected to determine if migration of contaminants has occurred. The contaminant screening resulted in only one radionuclide (cesium-137) being retained as a COPC for humans and no COPCs for ecological receptors.

The cesium-137 was detected at every sample location throughout the mound, with the highest detected concentration (52 pCi/g) at location M19. While the UCL concentration for the cesium-137 was 30.53 pCi/g. Therefore, the horizontal extent of the cesium-137 is defined as the entire length of the mound 500 $\times$ 20 feet. For the vertical extent of the cesium-137 contamination, there is a significant decrease in concentrations (approximately one order of magnitude) between the surface and subsurface samples. The maximum detected C-137 concentration in the subsurface sample was only 5.9 pCi/g.

Nevertheless, as this concentration is above the established background, the vertical extent of contamination will be 4 feet.

5.7.2.10 Industrial Waste Discharge Ditch

The Industrial Waste Lift Station Discharge Ditch (ANL-35), also known as the North Ditch, is located inside the ANL-W security fences. The ditch is approximately 500 feet in length with a bottom width of 3 to 4 feet. At any one time, there is approximately 2 to 3 inches of water in the ditch. The ditch receives industrial waste water, primarily cooling water and photo processing wastes (e.g., photo developers, fixers, and stabilizers, and acids), but also including several retention tank overflows that may contain ethanol, sodium hydroxide, and some radionuclides, from a variety of facilities at ANL-W. The ongoing and future discharges of these processing wastes are regulated under other EPA laws such as RCRA. The cleanup action specified in this ROD address only those past releases of these processing wastes.

Soil samples were collected from this site on three separate occasions. Three soil samples were collected during the 1989, DOE Survey, 17 soil samples were collected during the 1988 Chen Northern sampling, and an additional 19 soil samples were collected in 1994 by ANL-W. Soil samples from all three sampling efforts were collected and analyzed for organics, inorganics, radionuclides, and dioxin/furans. Appendix A of the OU 9-04 Comprehensive RI/FS shows the sampling location plan map, color intensity profile maps, and statistics for COC by pathway for all samples collected in 1994 from the Industrial Waste Lift Station Discharge Ditch. Sample collection depths for the 1994 study were 0 to 6 inches and 1.5 to 2 feet.

The results of the contaminant screening resulted in no COPCs for human and only one inorganic, silver being retained as a COPC for the ecological receptors. Silver was analyzed for in all three studies and was detected at 87% (33 of 39) of the sample locations with the highest detection (352 mg/kg) at #41. This sample location is located in the middle of the ditch. The maximum concentration was used in risk assessment as the UCL value because of the small data set and large standard deviation in the data. However, high concentrations were also detected at other locations grid 18, ND03, 15, 18, and 19. Therefore, the horizontal extent of contamination is defined as the entire length of the ditch. No trends on the vertical extent of contamination were detected for silver. Thus, the average soil depth on top of the basalt 1.0 foot was used to define the vertical extent of contamination. Thus, the extent of contamination at the Industrial Waste Lift Station Discharge Ditch is defined as 15 × 500 × 1 foot.

5.7.2.11 Main Cooling Tower Riser Pits

The Cooling Tower Riser Pits consist of four pits located approximately 10 feet east of the Main Cooling Tower. Each of the four pits is approximately 12 feet deep with 9 to 15 inches of soil covering the rock bottom. During winter shutdown periods of the Main Cooling Tower, the riser pipes were drained to prevent damage caused by freezing and the riser pits are used to collect this discharge. The contaminant screening indicated that four inorganics be retained as COPCs for human health risk assessment. The four inorganics are arsenic, trivalent chromium, lead, and mercury. The maximum concentrations of each of these inorganics are 76, 1,717, 4,725, and 0.78 mg/kg, respectively. The extent of contamination is the entire inside dimension of each of the riser pits and the total depth of soil above the basalt (i.e., 6 x 10 x 1.5 feet).

5.8 No Action Sites

Based on the process used to conduct the OU 9-04 Comprehensive RI/FS, these sites were screened from the risk assessment. The screening process included review of the previous information, review of the risks presented in either a Track 1 or Track 2 type document, and evaluation of the contaminant source, and pathway to a receptor. These sites are considered to be no action sites even under an unrestricted land use scenario and hence will not require 5 year reviews. These sites are described in short detail below, additional details on these sites can be found in the OU 9-04 Comprehensive RI/FS.

5.8.1 Operable Unit 9-01 Sites

This OU consists of ten sites (ANL-04, -019, -28, -29, -30, -36, -60, -61, -62, and -63) that were identified in the FFA/CO. These ten sites consisted predominantly of low hazard miscellaneous sites with small discharges or construction wastes. Of the ten OU 9-01 sites, only two sites (ANL-04 and -61) were retained for further evaluation in the OU 9-04 Comprehensive RI/FS. The OU 9-04 Comprehensive RI/FS indicates that only ANL-04, the ANL-W sewage lagoons, pose unacceptable risks to the environment as discussed earlier in this ROD. A brief history of the other nine OU 9-01 sites that do not pose unacceptable risk follows:

Sludge Pit West of T-7 (Imhoff Tank) (ANL-19)—The Imhoff Tank and sludge pit collected sanitary waste from the power plant (Bldg. 768), the Fuel Conditioning Facility (Bldg. 765), the Laboratory and Office building (Bldg. 752), and the Fire House (Bldg. 759). The Imhoff Tank was used to settle out the sanitary wastes from 1963 to 1966. No potential source of hazardous materials is known to be associated with this site.

EBR-II Sump (ANL-28)—The EBR-II Sump is a 660-gallons underground coated carbon steel tank, 5 feet in diameter by 4.5 feet in depth located off the southwest corner of the Power Plant (Bldg. 768). The Sump is believed to have been installed in the early 1970s and is currently in use. The tank is a centralized collection facility for auxiliary cooling tower blowdown, ion exchange regeneration effluent, and small quantities of laboratory chemicals from the water chemistry laboratory in the Power Plant before discharging via a pipe to the Main Cooling Tower Blowdown Ditch. Currently, the Power Plant is not operating, but minor volumes of water chemistry water are still being discharged to the Main Cooling Tower Blowdown Ditch. No potential source of hazardous materials is known to be associated with this site.

Industrial Waste Lift Station (ANL-29)—The Industrial Waste Lift Station receives wastes from three major facilities; the Lab and Office (Bldg. 752), the Zero Power Physics Reactor (Bldg. 774), and the Fuel Manufacturing Facility (Bldg. 704). The only contaminant of potential concern identified from process knowledge of water released to the Industrial Waste Lift Station is silver. A Track 1 investigation was originally performed for this site and, based on the above information, it was determined that the potential health risks are less than the lower limit of the NCP target risk range.

Sanitary Waste Lift Station (ANL-30)—The Sanitary Waste Lift Station (Bldg. 778) was built in 1965. It receives all sanitary waste originating at ANL-W, with the exception of the Transient Reactor Test Facilities (Bldgs. 720, 721, 722, 724, and T-15), the Sodium Process Facility operations trailer, and the Sodium Components Maintenance Shop (Bldg. 793). The only waste discharged to the lift station was silver from photographic film development. The maximum detected silver concentration of 68 mg/kg was less than the cleanup goal across all exposure pathways of 1,350 mg/kg.

TREAT Photo Processing Discharge Ditch (ANL-36)—The Transient Reactor Test Photo Processing Discharge Ditch is located approximately 20 feet northeast of and parallel to the Photo Lab (Bldg. 724) and the TREAT Office Building (Bldg. 721). Approximately 400 gallons of photo processing solutions are estimated to have been discharged to the ditch over the 2-year period from 1977 to 1979. The maximum detected silver concentration of 17 mg/kg was less than the cleanup goal across all exposure pathways.

Knawa Butte (ANL-60)—The Knawa Butte is located due north of the Hot Fuel Examination Facility (Bldg. 785) near the security fence. The butte was used as a construction refuse pile until September 1972 when a service request was made to renovate the existing pile and convert it to a doughnut-shaped mound. The butte consists primarily of clean soil and rock excavated from ANL-W facility basement construction. No potential source of hazardous constituents is known to be associated with this site.

EBR-II Transformer Yard (ANL-61)—The EBR-II Transformer Yard located south of the EBR-II Power Plant (Bldg. 768) is the site of PCB and diesel fuel contamination. The PCB contamination is due to historic (i.e., prior to 1978) leakage from four transformers. All four transformers were replaced and the majority of the contaminated soil was removed during a cleanup action from 1988 through 1992. An additional area of PCB contaminated soil adjacent to an underground diesel storage tank was identified for removal. The PCB contaminated soil and underground diesel storage tank were removed in the summer of 1997. Verification samples were collected after removal and show that the remaining PCB contamination was remediated to the cleanup goal levels

Sodium Boiler Building Hotwell (ANL-62)—The Sodium Boiler Building (Bldg. 766) condensate hotwell, was built in 1962, and is located north of the EBR-II Power Plant (Bldg. 768). This hotwell, which is identical to the EBR-II Power Plant condensate hotwell, receives water from the steam trap and condensate drains. Neither hazardous constituents (hydrazine and tritium) believed to have been present at the site were detected.

Septic Tank 789-A (ANL-63)—This septic tank is located approximately 60 feet northeast of the Equipment Building (Bldg. 789-A) and was believed to have been installed in the late 1950s. No potential source of hazardous materials is known to be associated with this site.

5.8.2 Operable Unit 9-02 Site

OU 9-02 consists of one site (ANL-08, EBR-II Leach Pit) identified in the FFA/CO. The EBR-II Leach Pit is located between the inner and outer security fences in the southwest corner of the ANL-W facility. The Leach Pit was an irregularly shaped, unlined underground basin that was excavated with explosives into basalt bedrock in 1959. The Leach Pit was used to dispose of ANL-W liquid industrial waste including cooling tower blowdown, sanitary effluent, cooling condensates, and radioactive effluent, until 1973. The average annual discharge to the Leach Pit was approximately 9×10^4 gallons from 1960 to October 1973 containing a total of 10.4 curies of radioactivity. The majority of the sludge was removed during an interim action in December 1993, after which the bottom of the Leach Pit was lined with 2 to 3 inches of bentonite clay and backfilled to grade. A risk assessment performed on the concentration of the contaminants in the basalt and in the remaining sludge indicates that the total potential risk is 6E-06 from ingestion of groundwater contaminated with beryllium and neptunium-237, which is at the lower limit of the NCP target risk range (i.e., 1E-06). A Track 2 Summary Report was completed and signed by the RPMs that recommended additional evaluation of the vadose zone below the Leach Pit in the OU 9-04 Comprehensive RI/FS.

5.8.3 Operable Unit 9-03 Sites

OU 9-03 consists of three sites (ANL-05, -31, and -34) that were identified in the FFA/CO. These three sites had all received potentially hazardous chemicals that required additional sampling in order to determine the risks to human health and the environment. Of the three OU 9-03 sites, all three are recommended for No Action based on results in the Track 2 Summary Report.

ANL Open Burn Pits 1, 2, and 3 (ANL-05)—Three abandoned open burn pits are located at ANL-W. The pits were initially used to burn construction wastes, such as paper and wood in the early 1960's. In addition, approximately 150 gallons of organic wastes from analytical chemistry operations were disposed in the burn pits from 1965 to 1970. The organic wastes consisted primarily of toluene, xylene, hexane, isopropyl alcohol, butyl cellosolve, tributylphosphate, and mineral oil. A risk assessment was performed on the results of sampling and indicates that the potential risk from exposure to all contaminants detected is less than the lower limit of the NCP target risk range.

Industrial/Sanitary Waste Lift Station (ANL-31)—The Industrial/Sanitary Waste Lift Station (Bldg. 760) consists of an industrial and a sanitary lift station separated by a similar sump wall. The sanitary side is still used to pump sanitary wastes to the Sanitary Lagoons while the industrial side is inactive and has been backfilled with clean sand. Based on samples collected in the industrial side in 1995, the risk assessment indicated that several radionuclides pose a potential risk at the lower limit of the NCP target risk range for the current occupational scenario. Therefore in 1995, under a best management practice, ANL-W backfilled the industrial waste side with clean sand to remove the exposure route and removed the piping and contaminated soil from the Lift Station to the Meter House. Also under a best management practice the remaining 90 feet of the piping and soil from the Meter House to the EBR-II Leach Pit was removed in the summer of 1996. After the removals the verification samples collected showed that the remaining contaminants were below the cleanup goal concentrations.

Fuel Oil Spill by Building 755 (ANL-34)—ANL-34 is the site of a 50-gal spill of #5 fuel oil from an above ground storage tank. The spilled fuel oil occupied an area approximately 5 x 20 feet and was confined within the bermed area. A risk assessment was performed on the most mobile (i.e., naphthalene) and the most hazardous (i.e., benzene) constituents of the fuel oil. The risk assessment indicates that the risk would be below the lower limit of the NCP target risk range.

5.8.4 Operable Unit 9-04 Sites

OU 9-04 consists of five sites (ANL-01, -01A, -09, -35, and -53) that were identified in the FFA/CO. All five sites had received potentially hazardous chemicals that required additional sampling in order to determine the risks to human health and the environment. All of these sites were retained for detailed evaluation in the OU 9-04 Comprehensive RI/FS because they contained contaminants above the screening levels for either humans or the ecological receptors.

5.8.5 Operable Unit 10-06 Sites

Two WAG 10 sites at or near ANL-W that contain radionuclide-contaminated soils have been investigated in the OU 10-06 RI/FS. The two sites are the ANL-W—Windblown area and ANL-W—Stockpile site. These two sites are located within a mile of WAG 9 and are now included in the OU 9-04 Comprehensive RI/FS because the wastes had originated at ANL-W. Additional information on these two sites can be found in the 10-06 administrative record under INEL-94/0037 and INEL-95/0259. These two OU 10-06 sites are being incorporated into the OU 9-04 record of decision. The following two sections describe a short summary of the radionuclides detected and the associated risks.

ANL-W Windblown Area. This area actually consists of two areas, the windblown area around the remotely located TREAT reactor and the windblown area around the ANL-W facility. Soil samples were collected at both these facilities in 1993, and analytical results from soil samples collected by the Radiological and Environmental Sciences Laboratory (RESL, which is now called the Environmental Science & Research Foundation, Inc.) were used to evaluate risks from exposure to contaminants at the site. Risks for the current occupational exposure scenario and the future residential exposure scenario were within the NCP target risk range (i.e., 1E-04 to 1E-06). In addition to human health, risks to ecological receptors were also evaluated. This evaluation showed no unacceptable risks to populations of exposed ecological receptors.

ANL-W—Stockpile site. The ANL-W Stockpile is an abandoned borrow pit that was excavated as part of road building activities near ANL-W in the 1950s. The borrow pit is located on the west side of the ANL-W entrance road and is approximately 300 ft long and 200 ft wide. In 1975, ANL-W personnel used the borrow pit to dispose of approximately 1,058 cubic yards of low-level radionuclide contaminated soil from the ANL-W Interceptor Canal. The Operable Unit 10-06 Phase II field investigation was conducted at the ANL-W Stockpile to determine the nature and extent of radionuclide- and metal- contaminated soils within the stockpile. Radioactive hot spots were identified in the stockpile soil using field radiation survey instruments. Data were collected from three of the hot spots. The main radionuclide contaminant that contributed most of the risk was cesium-137, with concentrations up to 26,700 pCi/g. The human health risk assessment that was performed indicated that for the 100-year residential exposure the total risk is 5E-03, which is attributed to the external exposure (4E-03) and food crop ingestion (9E-04) from Cesium-137. In 1996, a non-time critical removal action was performed on the radionuclide contaminated stockpile site. The contaminated soils were removed using large excavation equipment and the soil was transported to the Warm Waste Pond at the Test Reactor Area. The preliminary remediation goal (PRG) for the Cesium-137 contaminated soil was 16.7 pCi/g and remaining soils were below this level. The remaining risks associated with this site is 1E-05 which is within the NCP target risk range.

6 SUMMARY OF SITE RISKS

6.1 Human Health Risk Evaluation

The human health risk assessment consists of two broad phases of analysis: (1) a site and contaminant screening that identified COPCs at retained sites, and (2) an exposure route analysis for each COPC. The exposure route analysis includes an exposure assessment, a toxicity assessment, and a risk characterization discussion. The OU 9-04 Comprehensive Baseline Risk Assessment includes an evaluation of human health risks associated with exposure to contaminants through soil ingestion, fugitive dust inhalation, volatile inhalation, external radiation exposure, groundwater ingestion, ingestion of homegrown produce, dermal adsorption of groundwater, and inhalation of water vapors because of indoor water use.

6.1.1 Contaminant Identification

Historical sampling data were used to identify contaminants present in surface soils at the WAG 9 sites. The list of contaminants was screened based on comparison with background concentrations determined for the INEEL, a detection frequency of less than 5%, and no evidence that the contaminant was released at the site, and whether the contaminant is routinely considered to be an essential nutrient. The complete contaminant of concern list for each of the sites retained for evaluation are shown in Tables 3-3 through 3-18 of the OU 9-04 Comprehensive RI/FS. Because substances that are essential nutrients can be toxic at high concentrations, this final screening step was applied only when the essential nutrient concentrations were less than 10 times the background concentrations.

6.1.2 Exposure Assessment

The human health exposure assessment quantifies the receptor intake of COCs for select pathways. The assessment consists of estimating the magnitude, frequency, duration, and exposure route of chemicals to humans.

6.1.2.1 Exposure Scenarios

Only those exposure pathways deemed to be complete, or where a plausible route of exposure can be demonstrated from the site to an individual, were quantitatively evaluated in the risk assessment. The populations at risk because of the exposure from waste at the ANL-W were identified by considering both the current and future land use scenarios.

The residential scenarios model a person living on the site 350 days a year for 30 years, beginning in 2097 (100 years from 1997). The 100-year residential scenario was selected for analysis because the DOE control of the INEEL lands is currently expected to last for at least 100 years. For purposes of the baseline risk assessment the assumption was made that future residents will construct 10-foot basements beneath their homes, and so the residents could be exposed to contaminants down to that depth.

Two occupational scenarios were evaluated as part of the baseline risk assessment for ANL-W. The assumptions used in the baseline risk assessment include nonintrusive daily industrial use without restrictions for 250 days per year for 25 years. Two time periods that were evaluated are starting now

(1997) and lasting 25 years. The second occupational scenario that was evaluated starts in 30 years (2027) and lasts for 25 years.

6.1.2.2 Quantification of Exposure

The following exposure pathways were considered applicable to the evaluation of human exposure to contaminants at the ANL-W sites: ingestion of soil, inhalation of fugitive dust, inhalation of volatiles, external radiation exposure, groundwater ingestion (residential scenario only), ingestion of homegrown produce (residential use only), and inhalation from indoor use of groundwater (residential scenario only).

Adult exposures were evaluated for all scenarios and pathways (external exposure; inhalation of dust; and ingestion of soil, groundwater, and foods); child exposures (0 to 6 years old) were considered separately only for the soils ingestion pathways in the residential scenarios. Children were included because children ingest more soil than adults, significantly increasing their exposure rate.

The exposure parameters used in the risk assessment were obtained from EPA and DOE guidance. The exposure parameter default values used in the risk assessment are designed to estimate the reasonable maximum exposure at a site. Use of this approach makes under-estimation of actual cancer risk highly unlikely. The exposure parameters used in the risk assessment were:

- ***All Pathways***

-Exposure frequency, residential	350 days/yr
-Exposure frequency, occupational	250 days/yr
-Exposure duration, occupational	25 yr
-Exposure duration, residential	30 yr

- ***External exposure pathway***

-Exposure time, residential	24 hr/day
-Exposure time, occupational	8 hr/day

- ***Soil ingestion pathway***

-Soil ingestion rate, residential-adult	100 mg/day
-Soil ingestion rate, residential-child	200 mg/day
-Soil ingestion rate, occupational	50 mg/day
-Exposure duration, residential-adult	24 hr
-Exposure duration, residential-child	6 hr

- ***Dust inhalation pathway***

-Inhalation rate	20 m^3 of air/day

- ***Groundwater ingestion pathway***

-Groundwater ingestion rate, residential	2 L/day

The contaminant exposure point concentrations evaluated in the baseline risk assessment were developed from site-specific sampling information. The ninety-five percent upper confidence level (95% UCL) of the mean concentration for the data set were calculated and depending on the size of the data set, either the 95% UCL or the maximum detected concentration was used as the concentration in the risk assessment calculations. This follows EPA guidance to determine the reasonable maximum exposure concentrations for contaminants at WAG 9.

6.1.3 Toxicity Assessment

A toxicity assessment was conducted to identify potential adverse effects to humans from contaminants at ANL-W. A toxicity value is the numerical expression of the substance dose-response relationship used in the risk assessment. Toxicity values (slope factors and reference doses) for the sites were obtained from EPA's Integrated Risk Information System (IRIS) database and EPA's *Health Effects Assessment Summary Tables*: Annual FY-95, 903-R-94-020, November 1995.

For the eleven sites that were retained for detailed analysis of human health risks, only one contaminant has been identified as a COPC in the Nature and Extent of Soil Contamination (Section 5.7.2 of this ROD). This contaminant is cesium-137 which is rapidly absorbed into the bloodstream of humans and is distributed thoughout the active tissures of the body. Metabolically, cesium-137 behaves as an analog of potassium. Its distribution throughout the body and the energetic beta and gamma radiation from its decay daughter, barium-137 metastable result in essentially whole-body irradiation.

6.1.4 Human Health Risk Characterization

Excess lifetime cancer risks are estimated by multiplying the intake level (developed using the exposure assumptions) by the slope factor. These risks are probabilities that are generally expressed in either scientific notation ($1x10^{-6}$) or exponential notation (1E-06). An excess lifetime cancer risk of 1E-06 indicates that, an individual has an additional one in one million chance of developing cancer over a lifetime as a result of site-related exposure to a carcinogen under the specific exposure conditions at a site. If an individual has a typical United States average cancer risk of 1 in 4, or 25 percent, then exposure to a carcinogen at the risk threshold concentration would raise his cancer risk to 0.250001 from 0.25. Excess cancer risks estimated below 1E-06 typically indicate that no further investigation or remediation is needed. Risks estimated between 1E-04 to 1E-06 indicate that further investigation or remediation may be needed. Risks estimated above the 1E-04 typically indicate that further action is appropriate. However, the upper boundary of the risk range is not a discrete line at 1E-04, although EPA generally uses 1E-04 in making risk management decisions. A specific risk estimate above 1E-04 may be considered acceptable if justified based on site-specific conditions.

The calculation of the noncarcinogenic hazard quotients were also calculated for the contaminants at WAG 9. The hazard quotients are ratios of a single substance exposure level to a reference dose for the same time duration. The tolerance ability for humans varies and the reference dose is based on the most susceptible individuals and then multiplied by the uncertainty factors (up to 10,000). This produces a very conservative value for non-cancer causing COC's . The hazard quotients are added together by exposure pathway to determine the hazard index.

For the sites that were retained for detailed analysis of the risks in the OU 9-04 Comprehensive RI/FS, ANL-W has prepared summary tables of the routes and calculated risks. These tables have been separated out by the contaminants contributing to each of the risk ranges (i.e., risks > 1E-04, risks between 1E-04 and 1E-06, and sites with HI greater than 1). The complete list of calculated carcinogenic and non-carcinogenic risk values is found in Appendix B of the OU 9-04 Comprehensive RI/FS. Each of these tables shows the release site, exposure scenario, exposure pathway, COC contributing to the risk, calculated risk or hazard quotient, and total exposure pathway excess cancer risk or hazard index. Table 6-1 shows only those sites with contaminants that have exposure pathway cancer risks greater than 1E-04. For contaminants that have not been identified as being a carcinogen the contaminant may still pose health risk to humans. The sites and contaminants with exposure pathway hazard index greater than 1 are shown in Table 6-2. Table 6-3 shows the sites and contaminants that have calculated exposure pathways cancer risks between 1E-04 and 1E-06. For the sites, contaminants, and exposure pathways with cancer risks less than 1E-06 have been screened from inclusion in this ROD.

6.1.5 Risk Management

The risk management process is used to formally document decisions that have been made by ANL-W, the EPA, and IDHW project managers to determine validity of the risk assessment to the actual site conditions. The baseline risk assessment results tend to be very conservative and are based on the EPA's default exposure parameters. These default exposure parameters tend to overestimate the exposure for a small site on the INEEL. The risk management section (5.11) of the OU 9-04 Comprehensive RI/FS described the 5 screening steps used by WAG 9 to determine which sites really pose unacceptable risks to human health or the environment. The five steps are: (1) elimination of sites with carcinogenic risk less than 1E-06; (2) elimination of sites with carcinogenic risks between 1E-04 and 1E-06, a risk management decision; (3) elimination of sites that the COC or exposure pathway has been eliminated; (4) elimination of contaminants at or below ANL-W specific background concentrations; and finally (5) elimination of sites with hazard quotients less than 1. Based on the risk management evaluation process, the human health evaluation resulted in three areas with unacceptable risks to human health. These three areas are the Industrial Waste Pond (ANL-01), the Interceptor Canal-Canal (ANL-09) and the Interceptor Canal-Mound (ANL-09). The contaminants, pathway, and risks for these three areas are shown in Table 6-4.

6.1.6 Human Health Risk Uncertainty

Many of the parameters used to calculate risks in the WAG 9 Baseline Risk Assessment and Ecological Risk Assessment (ERA) have various uncertainties associated with them. For example, limitations in site sampling produce some uncertainty associated with the extent of contamination at most of the WAG 9 sites. Limitations in the characterization of the WAG 9 physical environment produce some uncertainty associated with fate and transport properties of WAG 9 contaminants. To offset these uncertainties, parameter values were selected for use in the Baseline Risk Assessment and ERA so that the assessment's results would present an upper bound, yet reasonable, estimate of WAG 9 risks.

Table 6-5 shows risk assessment parameter, the uncertainties associated with it, and the effect on the risk. Uncertainties in analytical data include collection and evaluation are produced by variability in observed concentrations due to sampling design and implementation, laboratory analysis methods, seasonality, contaminant level variation, and natural concentration variation. Toxicity assumption uncertainties are inherent due to the nature of collecting toxilogical information from animal studies and relating those to humans. Other toxilogical uncertainties are encountered when uncertainty factors and modifying factors are used in derivation of the slope factors and reference doses. The exposure assessment uncertainties are produced by characterizing transport, dispersion, establishment of exposure settings, and derivation of chronic intakes. Contaminant modeling uncertainties are encountered when

Table 6-1. Exposure sites with human health risks greater than 1E-04.

ANL-W Release Site	Exposure Scenario	Exposure Pathway	Contributing COC	Calculated Cancer Risk	Exposure Pathway Cancer Risk	Justification for Screening (Step #)
ANL-01-IWP	0-25-year Occupational	External Radiation Exposure	Cs-137	8E-04	9E-04	NA
	30-55-year Occupational	External Radiation Exposure	Cs-137	4E-04	5E-04	NA
	100-year Residential	External Radiation Exposure	Cs-137	1E-04	4E-04	NA
ANL-09-Canal	0-25-year Occupational	External Radiation Exposure	Cs-137	5E-04	5E-04	3
	30-55-year Occupational	External Radiation Exposure	Cs-137	2E-04	2E-04	3
ANL-09-Mound	0-25-year Occupational	External Radiation Exposure	Cs-137	8E-04	8E-04	NA
	30-55-year Occupational	External Radiation Exposure	Cs-137	4E-04	4E-04	NA
	100-year Residential	External Radiation Exposure	Cs-137	1E-04	1E-04	NA
ANL-61A	100-year Residential	Ingestion of Soil	PCBs	6E-04	6E-04	3
	1,000-year Residential	Ingestion of Soil	PCBs	6E-04	6E-04	3
	100-year Residential	Ingestion of Homegrown Produce	PCBs	2E-04	2E-04	3
	1,000-year Residential	Ingestion of Homegrown Produce	PCBs	2E-04	2E-04	3
All WAG 9 sites (Cum Pathway)	100- and 1,000-year Residential	Ingestion of Groundwater	Arsenic	3E-04	3E-04	4
	100- and 1,000-year Residential	Inhalation of vapors from indoor water use	Arsenic	1E-03	1E-03	4

Table 6-2. Contaminant hazard index greater than 1 for OU 9-04 exposure sites, scenarios, and pathways.

ANL-W Release Site	Exposure Scenario	Exposure Pathway	Contributing COC	Calculated Excess Hazard Quotient	Exposure Pathway Hazard Index	Justification for Screening (Step #)
ANL-01-IWP	100- and 1,000 year Residential	Ingestion of Soil	Arsenic Chromium (VI)	0.3 0.8	1	4
		Ingestion of Homegrown Produce	Zinc Mercury	0.4 0.5	1	5
ANL-01-Ditch A	100- and 1,000 year Residential	Ingestion of Homegrown Produce	Zinc Mercury	0.1 0.9	1	5
ANL-01-Ditch B	100- and 1,000 year Residential	Ingestion of Homegrown Produce	Zinc Mercury	0.8 0.5	1	5
All WAG 9 sites (Cumulative Pathway)	100- and 1,000 year Residential	Ingestion of Groundwater	OCDD 2,4,5-TP (silvex) Antimony Arsenic Cadmium Fluoride Selenium Zinc	3E-01 2E-01 2E-01 1E+00 6E-01 1E+00 2E-01 2E-01	5	4 & 5

Table 6-3. Exposure sites with risks greater than 1E-06 and less than 1E-04.

ANL-W Release Site	Exposure Scenario	Exposure Pathway	Contributing COC	Calculated Cancer Risk	Exposure Pathway Cancer Risk	Justification for Screening (Step #)
Main Cooling Tower Blowdown Ditch (ANL-01A)	0-25- and 30-55-year Occupational	Ingestion of Soil	Arsenic	1E-05	1E-05	2
	0-25- and 30-55-year Occupational	External Radiation Exposure	U-238	2E-06	2E-06	2
	100-year Residential	Ingestion of Soil	Arsenic	5E-05	5E-05	2
	100-year Residential	External Radiation Exposure	U-238	4E-06	4E-06	2
	100 Residential	Ingestion of Homegrown Produce	Arsenic	5E-06	5E-06	2
Industrial Waste Pond (ANL-01)	0-25- and 30-55-year Occupational	Ingestion of Soil	Arsenic	5E-06	5E-06	2
	0-25- Occupational	External Radiation Exposure	Co-60	6E-06	9E-04	2
	100-year Residential	Ingestion of Soil	Arsenic	7E-05	7E-05	2
	100-year Residential	Ingestion of Homegrown Produce	Arsenic	8E-06	8E-06	2
Ditch A (ANL-01)	0-25- and 30-55-year Occupational	Ingestion of Soil	Arsenic	4E-06	4E-06	2
	0-25- and 30-55-year Occupational	External Radiation Exposure	U-238	5E-06	5E-06	2

Figure 6-3. Continued.

ANL-W Release Site	Exposure Scenario	Exposure Pathway	Contributing COC	Calculated Cancer Risk	Exposure Pathway Cancer Risk	Justification for Screening (Step #)
	100-year Residential	Ingestion of Soil	Arsenic	3E-05	3E-05	2
	100-year Residential	External Radiation Exposure	U-238	9E-06	9E-06	2
	100-year Residential	Ingestion of Homegrown Produce	Arsenic	4E-06	4E-06	2
Ditch B (ANL-01)	0-25- and 30-55-year Occupational	Ingestion of Soil	Arsenic	2E-06	2E-06	2
	100-year Residential	Ingestion of Soil	Arsenic	2E-05	2E-05	2
	100-year Residential	Ingestion of Homegrown Produce	Arsenic	3E-06	3E-06	2
Ditch C (ANL-01)	0-25- and 30-55-year Occupational	Ingestion of Soil	Arsenic	2E-06	2E-06	2
	0-25- Occupational	External Radiation Exposure	Co-60 U-238	1E-06 2E-05	2E-05	2 2
	30-55-year Occupational	External Radiation Exposure	U-238	2E-05	2E-05	2
	100-year Residential	Ingestion of Soil	Arsenic U-238	2E-05 2E-06	2E-05	2 2
	100-year Residential	External Radiation Exposure	U-238	3E-05	3E-05	2
	100-year Residential	Ingestion of Homegrown Produce	Arsenic	3E-06	3E-06	2

Figure 6-3. Continued.

ANL-W Release Site	Exposure Scenario	Exposure Pathway	Contributing COC	Calculated Cancer Risk	Exposure Pathway Cancer Risk	Justification for Screening (Step #)
Interceptor Canal- Canal (ANL-09)	0-25- and 30-55-year Occupational	Ingestion of Soil	Arsenic	3E-06	3E-06	2
	0-25-year Occupational	External Radiation Exposure	Co-60	2E-06	5E-04	2
	100-year Residential	Ingestion of Soil	Arsenic	3E-05	3E-05	2
	100-year Residential	External Radiation Exposure	Cs-137	8E-05	8E-05	2
	100-year Residential	Ingestion of Homegrown Produce	Arsenic	3E-06	3E-06	2
Interceptor Canal-Mound (ANL-09)	0-25-year Occupational	External Radiation Exposure	Co-60 U-238	1E-05 2E-06	8E-04	2 2
	30-55-year Occupational	External Radiation Exposure	U-238	2E-06	4E-04	2
	100-year Residential	External Radiation Exposure	U-238	3E-06	1E-04	2
Industrial Waste Liftstation Discharge Ditch (ANL-35)	0-25-year Occupational	External Radiation Exposure	Co-60 Cs-137 U-238	2E-06 5E-05 2E-06	6E-05	2 2 2

Figure 6-3. Continued.

ANL-W Release Site	Exposure Scenario	Exposure Pathway	Contributing COC	Calculated Cancer Risk	Exposure Pathway Cancer Risk	Justification for Screening (Step #)
	30-55-year Occupational	External Radiation Exposure	Cs-137	3E-05		2
			U-238	2E-06	3E-05	2
	100-year Residential	External Radiation Exposure	U-238	3E-06		2
			Cs-137	9E-06	1E-05	2
Cooling Tower Riser Pits-South (ANL-53)	0-25- and 30-55-year Occupational	Ingestion of Soil	Arsenic	2E-06	2E-06	2
	100-year Residential	Ingestion of Soil	Arsenic	2E-05	2E-05	2
	100-year Residential	Ingestion of Homegrown Produce	Arsenic	3E-06	3E-06	2
EBR-II Transformer Yard (ANL-61A)	0-25- and 30-55-year Occupational	Ingestion of Soil	PCB's	7E-05	7E-05	2
All WAG 9 sites (Cumulative Pathway)	100- year Residential	Ingestion of Groundwater	Bis(2-Ethylhexyl) Phthalate	4E-06		2
			Methylene Chloride	7E-06	1E-06	2
	100- year Residential	Inhalation of water vapors from Indoor Water Use	Methylene Chloride	1E-06	1E-06	2

Figure 6-3. Continued.

ANL-W Release Site	Exposure Scenario	Exposure Pathway	Contributing COC	Calculated Cancer Risk	Exposure Pathway Cancer Risk	Justification for Screening (Step #)
TREAT Windblown Area (10-06)	30- year Residential	Ingestion of Homegrown Produce	Sr-90	2E-06	2E-06	2
Stockpile Soil (10-06)	100-year Residential	External exposure	Cs-137	1E-05	1E-05	2
All WAG 9 sites (Cumulative Pathway)	100- year Residential	Ingestion of Groundwater	Bis(2-Ethylhexyl) Phthalate	4E-06		2
			Methylene Chloride	7E-06	1E-06	2
	100- year Residential	Inhalation of water vapors from Indoor Water Use	Methylene Chloride	1E-06	1E-06	2

Table 6-4. Sites retained for evaluation in the feasibility study because of human health risks.

ANL-W Release Site	Exposure Scenario	Exposure Pathway	Contributing COC	Calculated Cancer Risk	Exposure Pathway Cancer Risk	Justification for Screening (Step #)
ANL-01-IWP	0-25-year Occupational	External Radiation Exposure	Cs-137	8E-04	9E-04	NA
	30-55-year Occupational	External Radiation Exposure	Cs-137	4E-04	5E-04	NA
	100-year Residential	External Radiation Exposure	Cs-137	1E-04	4E-04	NA
ANL-09-Mound	0-25-year Occupational	External Radiation Exposure	Cs-137	8E-04	8E-04	NA
	30-55-year Occupational	External Radiation Exposure	Cs-137	4E-04	4E-04	NA
	100-year Residential	External Radiation Exposure	Cs-137	1E-04	1E-04	NA

default values are used instead of actual site conditions and model outputs cannot be verified with actual data.

Table 6-5. Uncertainties associated with the human health risk assessment.

Area	Uncertainties	Effect on Risk
Sampling and Analysis	A representative concentration may not have been obtained where limited sampling was performed.	Overestimate or Underestimate
Concentration Terms	95% UCL values were used in Risk Assessment.	Overestimate
	ANL-W used one-half the detection limit when the constituent is not detected.	Overestimate
Fate and Transport	Use of conservative generic modeling parameters may not be truly representative of ANL-W site conditions.	Overestimate
	Distribution coefficient values have wide ranges for various soil types.	Overestimate
GWSCREEN Modeling	GWSCREEN input parameters (i.e., contaminant solubility limit, distribution coefficient (k_d), and infiltration rate are considered conservative, but contain some uncertainty.	Underestimate or Overestimate
	Maximum source term concentrations are assumed for the entire volume modeled for each site.	Overestimate
Exposure Assessment	Assumes residence could be established in area that are uninhabitable due to physical or administrative limitations.	Overestimate
	Default exposure values assume maximum possible exposure times, particularly for the occupational scenario where exposure times were 8 hours per day rather than more realistic time of a maximum of a few hours a week.	Overestimate
	The dermal absorption pathway was not included in the risk assessment calculations.	Underestimate
Toxicity Assessment	Use of parent nuclide slope factor plus daughter (+D) rather than adding slopes for each radionuclide.	Underestimate
	Extrapolation of values from nonhuman studies to humans, from high doses to low doses.	Overestimate or Underestimate
	Chromium was assumed to be 10% hexavalent and 90% trivalent form based on worst case studies at ANL-W.	Overestimate
	Route-to-route extrapolations are used.	Overestimate or Underestimate
Risk Characterization	Risks are added across constituents and pathways, although they may not affect the same target organ or mechanisms of damage.	Underestimate or Overestimate
	Assumption that constituents are evenly distributed at the 95% UCL concentration.	Overestimate
	Toxicity values for some constituents such as chromium and silver are based on industrial conditions.	Overestimate

6.2 Ecological Evaluation

The ecological assessment for ANL-W is a quantitative evaluation of the potential effects of the sites on plants and animals other than people and domesticated species. A quantitative ecological assessment is planned in conjunction with the INEEL-wide comprehensive RI/FS scheduled for 1999. The assessment endpoints developed around the protection of biota represented by functional groups and individual threatened and endangered and Category 2 species known to exist at ANL-W. Assessment endpoints were defined for ANL-W were in the INEEL ERA Guidance Manual (VanHorn et al., 1995) and incorporate the suggested criteria for developing assessment endpoints, including ecological relevance and policy goals (EPA 1992).

The selection of measurement endpoints for the ANL-W flora and fauna were not surveyed directly. Rather, published references were used as the primary sources of ecological and toxicological data from measurement endpoints were derived. Values extracted from these references were used to calculate the ecological based screening levels for all ecological receptors and to develop the toxicity reference values for the contaminants.

The measurement endpoints are the modeled dose as compared to the toxicity reference values (TRVs) for each contaminant for each receptor or functional group. The dose was divided by the TRV to produce a hazard quotient (HQ) for each contaminant and receptor of concern. The HQ is ultimately used to measure whether the assessment endpoint has been attained, that is, no indication of possible effects is determined (i.e., HQs are less than target value for all receptors for each contaminant). This target value for the ecological HQs was established to be 10 times the HQ of the 95% UCL for the INEEL background.

This INEEL-wide ecological assessment provided an indication of the affect of INEEL releases in the ecology at a population level. In the area near ANL-W, there are no critical or sensitive habitats. Based on the present COCs and ecological information the quantitative eco-evaluation performed for this ROD. Six areas pose potentially unacceptable risks to the ecological receptors for up to five inorganics; chromium, mercury, selenium, silver, and zinc. Of these six areas, one also shows unacceptable human health risks. Table 6-6 lists the six areas, contaminants of concern, and corresponding mltiplication of the HQ above the INEEL background HQ for those sites that were retained for the ecological receptors.

6.2.1 Species of Concern

The only federally listed endangered species known to frequent the INEEL is the peregrine falcon. The status of the bald eagle in the lower 48 United States was changed from endangered to threatened in July 1995. Several other species observed on the INEEL are the focus of varying levels of concern by either federal or state agencies. Animal and avian species include the ferruginous hawk, the northern goshawk, the sharp-tailed grouse, the loggerhead shrike, the Townsend's big-eared bat, the pygmy rabbit, the gyrfalcon, the boreal owl, the flammulated owl, the Swainson's hawk, the merlin, and the burrowing owl. Plant species classified as sensitive include Lemhi milkvetch, plains milkvetch, wing-seed evening primrose, nipple cactus, and oxytheca. Table 6-6 shows the sites of concern along with the functional group identification number and a species common in the functional group.

Table 6-6. Sites that have unacceptable ecological risks, HQ, functional group, and species.

FFA/CO Site	Area Name / size (ft)	COC	Multiple of INEEL natural background HQ*	Functional Group	Common Species
ANL-01	Industrial Waste Pond / 200x250x0.5	Cr+3	200	Plants	Numerous
		Hg	30	(M222)	Merriams shrew
		Se	20	(M222)	Merriams shrew
		Zn	20	(AV232)	Red-winged blackbird
ANL-01	Ditch A / 5x400x0.5	Hg	50	(AV132)	Sora
ANL-01	Ditch B / 5x1,400x1.3	Cr+3	20	Plants	Numerous
		Zn	15	(AV232)	Red-winged blackbird
ANL-01A	Main Cooling Tower Blowdown Ditch / 6x700x2	Cr+3	15	Plants	Numerous
		Hg	120	(M222)	Merriams shrew
ANL-04	Sewage Lagoons / 300x700x1	Hg	40	(M222)	Merriams shrew
ANL-35	Industrial Waste Lift Station Discharge Ditch / 4x500x1	Ag	30	Plants	Numerous

* The agencies agreed that action would be taken on WAG 9 sites where the hazard quotient caused by a COC exceeded the hazard quotient cased by natural background concentrations by a factor of 10 or more.

6.2.2 Exposure Assessment

The WAG 9 ecological risk assessment (ERA) evaluated all the FFA/CO sites and determined that five sites have a potential source of contamination and/or a pathway to ecological receptors. These sites were evaluated using the general approach as discussed in VanHorn et al. (1995) and following guidelines proposed by EPA (EPA 1992). The results of the ERA evaluation of the remaining sites are presented as a range of hazard quotients (HQs) calculated for functional groups. Due to the uncertainty in the ERA methods, HQs are used only as an indicator of risk and should not be interpreted as a final indication of actual adverse effects to ecological receptors. In addition, DOE used the INEEL 95% UCL background concentrations for the inorganics which resulted in HQs greater than 1. Based on the conservative nature of the HQ calculations, DOE will only remediate those WAG 9 sites that have HQs that are at least 10 times the HQ calculated using the INEEL or ANL-W specific 95% UCL background concentration. Six areas; ANL-01, Ditch A, Ditch B, ANL-01A, ANL-04, and, ANL-35 were retained because of ecological risks.

6.2.3 Ecological Risk Uncertainites

Uncertainty is inherent in the risk assessment process. Principal sources of uncertainty lie within the development of an exposure assessment. Uncertainties inherent in the exposure assessment are associated with estimation of receptor ingestion rates, selection of acceptable HQs, variations in background inorganic concentrations, estimation of site usage, and estimation of plant uptake factors and bioaccumulation factors. Additional uncertainties are associated with the depiction of site characteristics, the determination of the nature and extent of contamination, and the derivation of Threshold Limit Values. All of these uncertainties likely influence risk to some extent. Table 6-7 shows risk assessment parameter, the uncertainties associated with the identified parameter, and the effect on the risk.

The uncertainties for the ecological risk assessment conducted for WAG 9 include the use of HQ as an indicator of risk. The HQ is a ratio of the calculated dose for a receptor from a COC to the toxicity reference value. These ratios provide a quantitative index of risk to define functional groups or individual receptors under assumed exposure conditions. A HQ less than the target value (i.e., typically 1) implies "low likelihood" of adverse effects from that contaminant. However, in many cases, INEEL background concentrations of inorganics produced HQ greater than 1. Thus, for WAG 9 the approach of using the ten times the background HQ was adopted in establishing the action levels.

6.3 Groundwater Risks

The GWSCREEN model was selected to perform the groundwater contaminant fate and transport calculations. The source areas were modeled individually instead of modeling a single composited site. Each source area was located according to its physical geographic location within the ANL-W facility and the contaminant specific plumes were added together to determine the maximum contaminant concentration. The maximum contaminant concentration for the groundwater was then used in the risk assessment calculations. The results of the cumulative evaluation of the groundwater indicate that arsenic and chromium are the only contaminants that pose a potentially unacceptable groundwater contaminant levels. The maximum arsenic and chromium concentrations for the future residents 100-years in the future were calculated. The chromium risk were less than 1E+06 and the arsenic resulted in a risk of 3E-04 for the ingestion of groundwater and 1E-03, for the inhalation of vapors from indoor water use. Both risk values for arsenic exceeded the upper limit of the National Contingency Plan level of 1E-04. The arsenic was determined to be from natural sources at the INEEL and screened as a contaminant of concern during the risk management process for these CERCLA sites at ANL-W. Additional information on the groundwater modeling and screening of arsenic as a contaminant of concern at ANL-W can be found in the OU 9-04 Comprehensive RI/FS Sections 5.4, 5.5, 5.6, 5.7, 5.8, and 5.11.2.4.

6.4 Basis for Response

The ANL-W OU 9-04 Comprehensive RI/FS evaluated the risks associated with the 37 sites from WAG 9 along with two sites from WAG 10. Together these 39 sites were evaluated to determine the risks to the current and future receptor scenarios. The following two paragraphs explain which sites pose unacceptable risks for the human health and ecological receptors.

Table 6-7. Uncertainties associated with the ecological risk assessment.

Area	Uncertainties	Effect on Risk
Sampling and Analysis	A representaitve concentration may not have been obtained where limited sampling was performed.	Overestimate or Underestimate
Concentration Terms	95% UCL values were used in Risk Assessment.	Overestimate
	ANL-W used one-half the detection limit when the constituent is not detected.	Overestimate
Fate and Transport	Use of conservative generic modeling parameters may not be truly representative of ANL-W site conditions.	Overestiamate
	Distribution coefficient values have wide ranges for various soil types.	Overestimate
Functional Groups	The functional groups were designed to assess a hypothetical species using input values that represent the greatest exposure of the combined functional group members.	Overestimate
Estimation of Ingestion Rates	Only a few of the intakes for the terrestrial receptors were based on ingestion rates found in literature. Most of the ingestion rates were calculated using allometric equations available in literature.	Overestimate or Underestimate
Estimation of Plant Uptake Factors	Few bioaccumulation factors and plant uptake factors are available in the literature. In the absence of literature values, ANL-W calculated bioaccumulation and plant uptake factors from information in Baes. 1994.	Overestimate or Underestimate
Estimation of Toxicity Reference Values	Various adjustment factors are incorporated to extrapolate toxicity from the test organism to other species.	Overestimate or Underestimate
Site Use Factors	Home range is not known for many species and therefore a default of 1.0 was used.	Overestimate
Hazard Quotients	Variations in INEEL background concentrations of inorganics were not accounted for when calculating the toxicity reference values and ultimately effect the Hazard Quotient value.	Overestimate

Eight areas at ANL-W have actual or threatened releases of hazardous substances, which, if not addressed by implementing the response actions selected in this ROD, may present an imminent and substantial endangerment to public health, welfare, or the environment. These eight areas are; the Industrial Waste Pond (ANL-01), Ditch A (ANL-01), Ditch B (ANL-01), the Main Cooling Tower Blowdown Ditch (ANL-01A), the Sanitary Sewage Lagoons (ANL-04), the Interceptor Canal-Canal (ANL-09), the Interceptor Canal-Mound (ANL-09), and the Industrial Waste Station Discharge Ditch

(ANL-35). These eight areas with unacceptable human health or ecological risks are shown in Figure 6-1. A summary of the sites with actual or threatened releases of hazardous substances to humans or ecological receptors is shown in Table 6-8. These sites with unacceptable risks to humans and/or the ecological receptors are described in the following two paragraphs, respectfully.

The Baseline Risk Assessment (BRA) indicated that for the current and future occupational scenario, only one contaminant cesium-137, would produce an unacceptable risk to human health. The cesium-137 posed an unacceptable risk to both current and future occupational receptors and future residential receptors at two sites, the Industrial Waste Pond (ANL-01) and the Interceptor Canal-Mound (ANL-09). While the cesium-137 at the Interceptor Canal-Canal (ANL-09) site only poses an unacceptable risks for the current and future occupational receptors. The Interceptor Canal-Canal (ANL-09) risks will be mitigated for the current and future occupational receptors by implementation of the land use restrictions during the 100-year DOE control as defined in the in the land use assumptions. Thus, the Interceptor Canal-Canal (ANL-09) portion will only undergo implementation of standard operating procedures to reduce the risks to the occupational receptors to acceptable levels.

The results of the WAG 9 ERA indicate that of the 37 WAG 9 release sites and the 2 WAG 10 sites, only six areas produce potentially unacceptable risks for ecological receptors due to the presence of various inorganic contaminants. These six areas are; the Industrial Waste Pond, Ditch A, Ditch B (all from ANL-01), the Main Cooling Tower Blowdown Ditch (ANL-01A), the Sewage Lagoons (ANL-04), and the Industrial Waste Lift Station Discharge Ditch (ANL-35). The remaining sites that were evaluated as part of the OU 9-04 Comprehensive RI/FS had risks that were within the acceptable range of the National Contingency Plan. These sites are being mentioned here to formally document in this ROD that they require No Action.

None of the contaminants exceeded the hazard index of 1 for either the current or future occupational exposure route. The response actions selected in this ROD are designed to reduce the potential threats to human health and the environment to acceptable levels.

Table 6-8. Sites with unacceptable human health or ecological risks.

ANL-W Area /Site Code	Human Health Risk?	Ecological Risk?
Industrial Waste Pond / (ANL-01)	Yes*	Yes*
Ditch A / (ANL-01)	No	Yes
Ditch B / (ANL-0)	No	Yes
Main Cooling Tower Blowdown Ditch / (ANL-01A)	No	Yes
Sewage Lagoons / (ANL-04)	No	Yes
Interceptor Canal-Canal / (ANL-09)	Yes	No
Interceptor Canal-Mound / (ANL-09)	Yes	No
Industrial Waste Lift Station Discharge Ditch / (ANL-35)	No	Yes

* This is the only site with both human health and ecological risks.

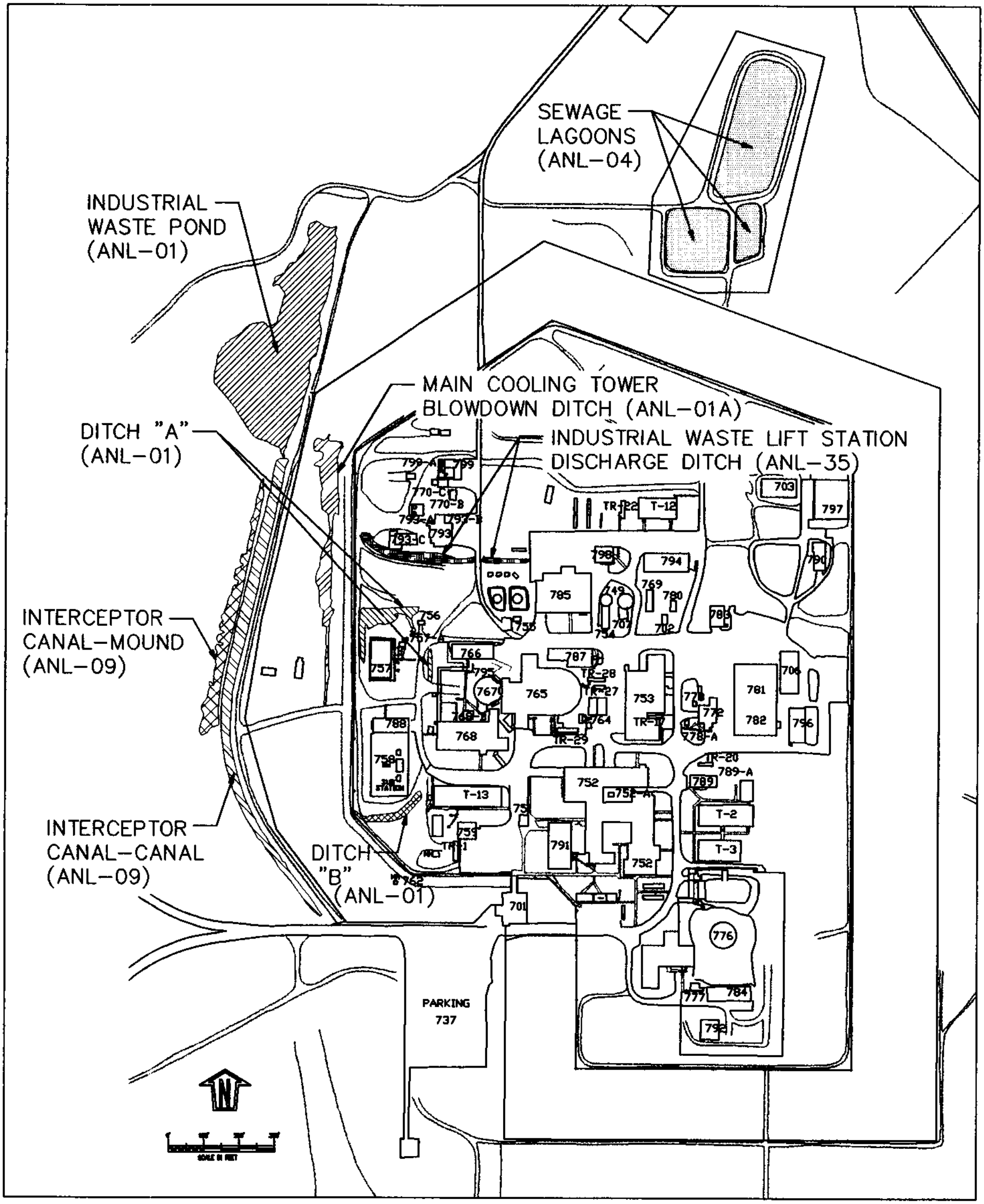

Figure 6-1. Eight Areas at ANL-W with Unacceptable Human Health or Ecological Risks.

FILE NAME: SITE-182.DWG
SHERRI L. PALMER 8-18-98

7 DESCRIPTION OF ALTERNATIVES

7.1 Remedial Action Objectives

Remedial action objectives (RAOs) for OU 9-04 sites with unacceptable risks were developed in accordance with the NCP and CERCLA RI/FS guidance. The RAOs were defined through discussions among the three agencies (IDHW, EPA, and DOE). The RAOs are based on the results of the human health and ecological risk assessment and are specific to the COCs and exposure pathways developed for OU 9-04. They are as follows:

- For protection of human health:
  - Prevent direct exposure to radionuclide contaminants of concern (COCs) that would result in a total excess cancer risk of greater than 1 in 10,000 to 1 in 1,000,000 (1E-04 to 1E-06) to current and future workers and future residents.

- For protection of the environment:

  Prevent exposure to COCs in soils which may have potential adverse effects to resident populations of flora and fauna, as determined by a HQ = 10 times the HQ calculated from INEEL background soil concentrations.

To meet these objectives, remediation goals (RGs) were established. These goals are quantitative cleanup levels based primarily on ARARs and risk-based doses. The RGs are used in remedial action planning and the assessment of effectiveness of remedial alternatives. Final RGs are based on the results of the baseline risk assessment and evaluation of expected exposures and risks for selected alternatives.

The 1 chance in 10,000 risk (1E-04) for human health and a hazard quotient of 10 times the INEEL background for ecological receptors were used to determine the RGs for the OU 9-04 sites of concern. For human health the basis for using the upper end of the NCP risk range of 1E-04 to 1E-06 was based on the remoteness of the INEEL site, conservativeness of the risk assessment, the absence of current residents, results based on the 100-year DOE control of INEEL lands, and current and future occupational workers are and will continue to be protected by standard operating procedures that are inplace and will continue to be updated while the ANL-W is operating. The RGs for the remediation of the cesium-137 for humans was determined by using a backward calculation of the concentration needed to produce a risk of 1E-04. Likewise, the RGs for the ecological receptors were also risk based and were determined by back calculating the concentrations equal to 10 times the HQ resulting from INEEL background soils. Table 7-1 shows the final RGs that have been established for the eight areas of concern at ANL-W.

Remedial actions will ensure that risk is mitigated to the point that exposure would not exceed these levels. On the basis of these RGs, areas and volumes of contaminated media that would require some form of remedial action were identified. These estimated areas, depths, and volumes for the eight areas to be remediated are presented in Table 7-2.

Table 7-1. Final Remediation Goals for the WAG 9 Sites.

Receptor	Site	Contaminant	95% UCL Concentration[1]	RG* Concentration[1]
Human Health	Interceptor Canal-Mound (ANL-09)	cesium-137	30.53	23.3
Human Health	Interceptor Canal-Canal (ANL-09)	cesium-137	18	23.3
Human Health	Industrial Waste Pond (ANL-01)	cesium-137	29.2	23.3
Ecological	Industrial Waste Pond (ANL-01)	chromium III	1,030	500
Ecological	Industrial Waste Pond (ANL-01)	mercury	2.62	0.74
Ecological	Industrial Waste Pond (ANL-01)	selenium	8.41	3.4
Ecological	Industrial Waste Pond (ANL-01)	zinc	5,012	2,200
Ecological	Ditch A (ANL-01)	mercury	3.94	0.74
Ecological	Ditch B (ANL-01)	chromium III	1,306	500
Ecological	Ditch B (ANL-01)	zinc	3,020	2,200
Ecological	Main Cooling Tower Blowdown Ditch (ANL-01A)	chromium III	709	500
Ecological	Main Cooling Tower Blowdown Ditch (ANL-01A)	mercury	8.83	0.74
Ecological	Sewage Lagoons (ANL-04)	mercury	3.2	0.74
Ecological	Industrial Lift Station Discharge Ditch (ANL-35)	silver	352	112

[1] - Concentrations in mg/kg or pCi/g
* - Backward calculated risk-based concentration at the 1E+04 level.

Table 7-2. Volume of Contaminated Soil in the Eight areas Retained for Cleanup.

OU 9-04 Release site	Site name	Width (ft)	Length (ft)	Depth (ft)	Volume (yd^3)
ANL-01	Industrial Waste Pond	200	250	0.5	926
ANL-01	Ditch A	5	400	0.5	37
ANL-01	Ditch B	5	1,400	1.3	337
ANL-01A	Main Cooling Tower Blowdown Ditch	6	700	2	311
ANL-04	Sewage Lagoons	300	700	1	7,778
ANL-09	Interceptor Canal-Mound	20	500	4	1,481
ANL-35	Industrial Waste Lift Station Discharge Ditch	4	500	1	74

7.2 Summary of Alternatives

In accordance with Section 121 of CERCLA, the FS identified alternatives that (a.) achieve the stated RAOs, (b.) provide overall protection of human health and the environment, (c.) meet ARARs, and (d.) are cost effective. These alternatives, used individually or in combination, can satisfy the RAOs through reduction of contaminant levels, volume or toxicity, or by isolation of contaminants from potential exposure and migration pathways. For the OU 9-04 sites, soil is the only medium of concern targeted for remediation. Five alternative categories were identified to meet the RAOs for contaminated soil at OU 9-04 sites:

1. No Action (with monitoring)
2. Limited Action
3. Containment with Institutional Controls
4. Excavation and Disposal
5. Phytoremediation

Estimated present work costs for the remedial alternatives for all sites are shown in Table 9-3 in Section 9. Post-closure costs were estimated for 100-years of monitoring for Alternative 3, where the contaminants were left at WAG 9. For Alternatives 4 and 5, where contaminants are removed or treated to meet the RAOs, the monitoring period extended to the end of the removal or until the RAOs are met through treatment. DOE controls will be implemented for Alternatives 4 and 5, after the RAOs are met.

7.2.1 Alternative 1: No Action (With Monitoring)

Formulation of a No Action alternative is required by the NCP [40 CFR 300.430 (e)(6)] and guidance for conducting feasibility studies under CERCLA. The No Action alternative serves as the baseline for evaluating other remedial action alternatives. This alternative can include environmental monitoring, but does not include actions to reduce potential exposure pathways, such as fencing or deed restrictions. Therefore, the No Action alternative developed for OU 9-04 sites involves only environmental monitoring (groundwater, air, and sediment) in accordance with DOE Orders and the ANL-W Environmental Monitoring Plan for at least 100 years after site closure. The monitoring would be necessary to validate that none of the contaminants were shown to migrate off-site or into the groundwater through modeling used in the OU 9-04 Comprehensive RI/FS.

While the No Action alternative does not involve any construction or operational activities that would result in disturbances to the surfaces of the OU 9-04 sites, IDAPA 16.01.01.650 (Rules for fugitive dust) could nonetheless apply to any sites that were a source of fugitive dust and is, therefore considered an ARAR that would not be met. Inorganics present in fugitive dust would not meet IDAPA 16.01.01.585-586 (Rules for the Control of Air Pollution in Idaho). IDAPA 16.01.11.200 (Rules for groundwater quality) would be met by ongoing groundwater monitoring. The No Action alternative would not meet DOE Orders because health risks to current workers and the potential future residents exceed allowable ranges. The estimated cost for implementing the No Action (with monitoring) alternative is relatively low when compared to the other alternatives.

7.2.2 Alternative 2: Limited Action

The limited action alternative involves only institutional controls to remain in effect for the next 100 years. This alternative essentially continues management practices currently in place at OU 9-04 and will continue for the next 100 years of DOE control. Actions under this alternative focus on routine maintenance and upkeep of the drainage ditches and Industrial Waste Pond, restricting access (posting warning signs and deed restrictions), and environmental monitoring including radiation surveys.

Current management practices and institutional controls are in place as a result of DOE responsibilities and authorities for maintaining security, control, and safety at DOE facilities, These responsibilities and authorities have their basis in the Atomic Energy Act of 1954. For DOE facilities, Federal Regulation 10 CFR 835 implements the Radiation Protection Guidance to Federal Agencies for Occupational Workers, recommended by the EPA and issued by the President on January 20, 1987. The requirements of this regulation include standards for control of occupational radiation exposure, control of access to radiological areas, personnel training, and record keeping.

In addition, the regulations specify limits for maintaining occupational radiation exposure as low as reasonably achievable (ALARA), and requires that DOE activities be conducted in compliance with a documented radiation protection program approved by DOE. At the INEEL, the requirements of 10 CFR 835 are primarily implemented through DOE Order 5400.5. Regulations for protection and security of DOE facilities are included in 10 CFR 860, which prohibits unauthorized entry. This regulation is implemented through DOE Order 5632.1C.

Specific controls (e.g., fences, signs) that will be used to ensure that access will be restricted, the types of activities that will be prohibited in certain areas (e.g., excavation), and anticipated duration of such controls will be placed in the "INEEL Comprehensive Facility and Land Use Plan" maintained by the DOE-ID Office of Program Execution. DOE shall also provide the Bureau of Land Management the detailed description of controls identified above. This information will be submitted to the EPA and IDHW once it has been placed in the INEEL Comprehensive Facility and Land Use Plan.

Monitoring and radiation survey programs would be established to ensure that the contaminants remain within the boundaries of the OU 9-04 sites, and would provide early detection of potential contaminant migration. These programs would be implemented annually for the first 5 years following site closure. The need for further environmental monitoring would be evaluated and determined by the Agencies during subsequent 5-year reviews.

Short-term effectiveness of this alternative is considered high, as this alternative is already implemented at the most of the sites. Radiation control area fences and signs are maintained. No specialized equipment, personnel, or services are required to continue to implement the Limited Action alternative. Implementation of this alternative would have no physical effect or habitat alteration on the environment beyond what has already occurred. The estimated costs for this alternative are shown in Table 9-3 of this ROD.

7.2.3 Alternative 3a and 3b: Containment Alternatives and Institutional Controls

The two centralized containment alternatives consist of the consolidation and isolation of contaminated soil from potential receptors for the period of time that unacceptable cumulative exposure risks will be present. This consolidation would place the contaminated soils from the OU 9-04 sites into an engineered landfill at WAG 9. The landfill would have a thick soil and/or rock cover placed over it. The containment alternatives would include: long-term environmental monitoring, cover integrity monitoring and maintenance, access restrictions, and surface water diversion. Institutional controls are assumed to remain in effect for at least 100 years. These two centralized containment alternatives were considered for all eight areas at ANL-W.

Alternative 3a consists of consolidation of contaminated soils and capping with engineered cover originally developed by the Uranium Mill Tailings Remedial Action (UMTRA) program for stabilization of abandoned uranium mill tailings. This design, based on the recent biointrusion research studies at the INEEL, was recently constructed at the INEEL Stationary Low-Power Reactor-I burial ground site. Advantages of this engineered cover are:

- Requires minimal maintenance
- Inhibits inadvertent human intrusion
- Minimizes plant and animal intrusion
- Inhibits contaminant migration

The cover design consists of four layers of natural geological materials including native soil, gravel, basalt cobbles, and rip-rap. Implementing Alternative (3a), for sites at ANL-W would entail consolidation of soils from both the radiological and ecological sites into one centralized location at WAG 9 prior to capping. The volume of soils in most of the ANL-W sites is relatively small and the costs associated with building multiple engineered covers at each release site is not justifiable. The most logical centralized location for the engineered cover would be near the Interceptor Canal and the Industrial Waste Pond which have the largest volume of contaminated soil. The engineered cover (3a) would prevent both human and ecological receptors from contacting the soils. Additionally the engineered cover (3a) would be sloped accordingly to prevent ponding of surface waters which should have the potential to migrate through the soils and "leach out" the radiological and inorganic contaminants. Site-specific considerations (such as annual precipitation, frost depth, and anticipated soil erosion rates) would be used to design the optimum configuration for this alternative during the remedial design phase.

Alternative 3b consists of consolidation of contaminated soils in an engineered landfill with a native soil cover. The native soil cover would consist of 10 ft of clean INEEL soil, with a surface covering of vegetation, rock armor or other material. Implementing this alternative at OU 9-04 would require a centralized location near the release sites in which to build the containment, moving the contaminated soil to the centralized location, and then adding clean soil layers above grade to bring the total thickness to 10 ft. The native soil cover is applicable to both the radiologically and inorganically contaminated sites. The long-term effectiveness of this type of cap to prevent exposure of inorganics past the 100-year institutional control period is not known. The native soils cap would be effective for the radiological contamination since the cesium-137 risk would be at the upper limit of the NCP risk range within 130 years.

Each capping technology is designed to prevent direct radiation exposures to resist erosion due to wind and surface water runoff, and to resist biointrusion that may penetrate into the contamination zone, or facilitate erosion. The primary differences between the two capping technologies are the length of time these functions can be maintained and the effectiveness of the biointrusion and erosion control components of the designs. The design life of the capping technologies specified for the containment alternatives will depend on the construction materials specified, number and thickness of layers required, and sequence of those layers. The long-term effectiveness and permanence required by the Interceptor Canal-Mound (ANL-09) and the Industrial Waste Pond (ANL-01) is driven by the radioactive decay of the cesium-137 contaminant in their soils and sediments. The cesium-137 contaminant will decay to acceptable risk levels in 130 years. The multilayered engineered barrier design (alternative 3a) is likely to provide a higher level of protection against biointrusion. A 10-foot thick soil cover would eliminate intrusion into contaminated soil by most of the burrowing INEEL species, but not all plants and invertebrates. Root intrusion into contaminated soils could result in mobilization of radionuclides through the plant exposing environmental receptors. Costs associated with the cover alternatives at each site are detailed in Sections 8 and 9 of this ROD.

7.2.4 Alternatives 4a and 4b: Excavation and Disposal

These alternatives involve complete removal of contaminated materials that pose an unacceptable risk to human health and/or ecological receptors. Two alternatives were evaluated during the WAG 9 RI/FS. Alternative 4a consists of excavation and disposal at two on-INEEL location whereas in Alternative 4b the soils would be disposed at an off-INEEL private facility. Both Alternatives 4a and 4b would include collection of verification samples after removal to ensure that the final remediation goals were met.

Implementation of Alternative 4a would require excavating all soils and debris from the radiological and inorganic contaminated sites that are above the RGs, and transporting the soil to either the proposed INEEL Soil Repository, or the Radioactive Waste Management Complex (RWMC). An INEEL Soils Repository, is included as part of the WAG 3 Proposed Plan that will be presented for public comment in the fall of 1998. The other option for on-INEEL disposal is to use the currently operating RWMC facility. Each of these on-INEEL facilities are expected to have or will have specific acceptance criteria that the WAG 9 soils currently meet. The final selection between the on-INEEL disposal areas would be completed during the WAG 9 RD/RA workplan development that is scheduled to start in the summer of 1998. The excavation and transport of the radiologically contaminated soils would require additional monitoring to verify that workers do not receive excessive radiation exposure. Verification sampling would be used to ensure that all contamination exceeding RGs was removed.

Implementation of Alternative 4b would require excavation of all soils and debris from the radiological and inorganically contaminated soil sites that are above the RGs, and transporting the soil to a rail transfer station at the INEEL Central Facilities Area (CFA) for shipment to a private off-INEEL disposal facility. The operating permit for the private off-INEEL disposal facility will specify the radionuclide activity levels that can be accepted. The WAG 9 soils have concentrations that are currently acceptable by most off-INEEL facilities that are permitted to accept radiologically contaminated material. The excavation and transport of the radiologically contaminated soils would require additional monitoring to ensure that no excess exposures are encountered. Verification sampling would be performed to ensure all contamination above the RGs has been removed.

These alternatives will provide long-term effectiveness because the contamination would be removed from the site. Long-term monitoring would no longer be required, assuming removal of contaminated soils achieve acceptable levels. DOE will continue with short-term monitoring of the soil, air, vegetation, and groundwater for 20 years in accordnace with DOE Orders and the ANL-W Enviornmental Monitoring Plan until 2018. These samples will be collected only to ensure continued compliance of current discharges and/or migration from past releases. After implementation of either Alternative 4a or 4b, the contaminated soil concentrations will be below the remediation goals. The remediation will ensure that the RGs would meet the established remedial action objectives. Costs of the excavation and disposal for both on-INEEL Alternatives 4a (proposed INEEL Soils Repository or using the currently existing RWMC facility) as well as costs of Alternative 4b (private off-INEEL facility) are shown in Sections 8 and 9 of this ROD.

7.2.5 Alternative 5: Phytoremediation

Alternative 5, would be implemented for both the radiological and inorganic contaminated sites at ANL-W. This alternative would consist of in situ remediation of the contaminated sites using cultivated and harvested plants to extract contaminants from soil. This alternative would avoid high excavation, transport, and disposal costs. One site, the ANL-09-Mound, has radiological contamination to a maximum depth of four feet and may require grading of the contaminanted soils to facilitate the use of farming equipment.

The phytoremediation alternative appears to have applicability for remediation of contaminants for soils at ANL-W based on the performance of phytoremediation at other DOE sites. To determine if phytoremediation has the potential to meet the RAOs for ANL-W soils, bench-scale greenhouse test are currently being performed. The results of the bench-scale greenhouse tests will determine which plants have the greatest potential to remove the ANL-W radionuclides and inorganics. The bench-scale testing is currently being conducted, with presentation of results scheduled for late summer of 1998. A phytoremediation Work Plan has been written to describe the major activities associated with the bench-scale testing of phytoremediation on ANL-W soils.

If, after the bench-scale greenhouse tests is completed, the results are not favorable (based on problems with contaminant extraction rates, costs, or increased contaminant leaching due to irrigation), phytoremediation will be eliminated as a possible alternative. If the bench-scale testing shows favorable results, ANL-W will conduct a full-scale two-year demonstration field test in 1999 and 2000 on the ANL-W sites of concern. Engineering controls would be utilized to control possible spread of contamination. Propagation of nonnative plants will be controlled by harvesting prior to the plants going to seed. The plant matter will be dried, baled, and stored in a controlled area prior to shipment to an incinerator for volume reduction in accordance with off-site requirements. Air pollution controls used to control air emissions would be required and the resulting ash would be properly disposed of in an approved disposal facility. Depending on the plants that are selected, two or more "crops" are possible each field season. After completion of the two-year demonstration field test (1999 and 2000), ANL-W will collect data to determine if the process is working as predicted in the actual field situation. This data will be used to determine the remaining number of field seasons that would be required to meet the RGs as well as provide a means of projecting future costs. This field data would be required to determine the feasibility of the technology for the treatment of the radiological and inorganic contaminants at WAG 9. In the fall of 2000, after analysis of the soil samples, the agencies will review the data and make the determination on continued use of phytoremediation at WAG 9. If phytoremediation is working and the process is continued, verification sampling would be used after the final field season to ensure that the RGs have been met.

This alternative provides long-term effectiveness and permanence because the soils would actually be treated insitu to remove the contaminant. Long-term monitoring would no longer be required, assuming removal of contaminated soils achieve acceptable levels. DOE will continue with short-term soil, air, vegetation, and groundwater sampling for 20 years in accordance with DOE orders and the ANL-W Environmental Monitoring Plan until the year 2018. These samples will be collected only to ensure continued compliance of current discharges and/or migration from past releases. CERCLA five-year reviews would be required for the next 100 years to ensure that the RGs would meet the established RAOs. DOE anticipates that the five-year reviews will consist of a memorandum summarizing a checklist-driven inspection of the signs, fences, and other physical features that assure DOE controls are still in place. Costs of insitu phytoremediation are shown in Sections 8 and 9, and are relatively low as compared to other alternatives that do not treat the contaminated soils.

7.3 Summary of Comparative Analysis of Alternatives

The five alternatives discussed in Section 7.2 were evaluated using the nine evaluation criteria as specified by CERCLA. These criteria are:

1. *Overall protection of human health and the environment*- addresses whether a remedy provides adequate protection of human health and the environment, and describes how risks posed through each exposure pathway are eliminated, reduced, or controlled through treatment, engineering controls, or institutional controls.

2. *Compliance with ARARs*- addresses whether a remedy will meet all of the ARARs under federal and state environmental laws and/or justifies a waiver.

3. *Long-term effectiveness and permanence*- refers to expected residual risk and the ability of a remedy to maintain reliable protection of human health and the environment over time, once cleanup goals have been met.

4. Reduction of toxicity, mobility, or volume through treatment- addresses the degree to which a remedy employs recycling or treatment that reduces the toxicity, mobility, or volume of the COCs including how treatment is used to address the principal risks posed

by the site.

5. *Short-term effectiveness*- addresses any adverse impacts on human health and the environment that may be posed during the construction and implementation period, and the period of time needed to achieve cleanup goals.

6. *Implementability*- addresses the technical and administrative feasibility of a remedy, including the availability of materials and services needed to implement a particular option.

7. *Cost*- includes estimated capital and operation costs, expressed as net present-worth costs.

8. *State acceptance*- reflects aspects of the preferred alternative and other alternatives that the state favors or objects to, and any specific comments regarding state ARARs or the proposed use of waivers.

9. *Community acceptance*- summarizes the public's general response to the alternatives described in the Proposed Plan and in the RI/FS. The evaluation of this criterion is based on public comments received.

Table 7-3 presents the results of the comparative analysis of the five alternatives using a ranking based on an alternative's ability to meet the nine evaluation criteria. Table 7-4 provides a ranking of alternatives for each on the basis of the comparative analysis. The following sections describe how each alternative either does or does not meet the criteria.

Each of the five alternatives subjected to the detailed analysis was evaluated against the nine evaluation criteria identified under CERCLA. The criteria are subdivided into three categories: (1) threshold criteria that mandate overall protection of human health and the environment and compliance with ARARs; (2) primary balancing criteria that include long- and short-term effectiveness, implementability, reduction in toxicity, mobility, or volume through treatment, and cost: and (3) modifying criteria that measure the acceptability of alternatives to state agencies and the community. The following sections summarize the evaluation of the five alternatives against the nine evaluation criteria.

7.3.1 Threshold Criteria

The remedial alternatives were evaluated in relation to the two threshold criteria: overall protection of human health and the environment and compliance with ARARs. The selected remedial action must meet the threshold criteria. Although the No Action alternative does not meet the threshold criteria, this alternative was used in the detailed analysis as a baseline against which the other alternatives were compared, as directed by EPA guidance. Alternatives 2 and 3b, limited action and containment with native soil cover, respectively, do not meet the threshold criteria for protection of the environment due to the potential for plant root intrusion and were screened from further evaluation in the FS.

Table 7-3. Comparative Analysis of Remedial Alternatives Using the Evaluation Criteria.

Criteria	Alternative 1 No action	Alternative 3a Engineered cover	Alternative 4a: Conventional excavation and off-site disposal at INEEL Soil Repository or RWMC	Alternative 4b: Conventional excavation and off-site disposal at private facility	Alternative 5: Phytoremediation
Overall protection of human health and the environment					
Human health protection	No reduction in risk.	Engineered cap would prevent direct exposure to contaminated soil and debris for over 130 years. Minimal exposure risks during cap construction.	Eliminates potential exposure from contaminated soil at site. Protectiveness is based on completely removing contamination from site. Short-term risk is moderate due to direct exposure during excavation.	Eliminates potential exposure from contaminated soil at site. Protectiveness is based on completely removing contamination from site. Short-term risk is moderate due to direct exposure during excavation.	Treatment reduces the potential exposure from contaminated soil at site to acceptable levels. Long term protectiveness is based on reduction of the concentrations. Short-term risk is low.
Environmental protection	Allows possible migration of contaminated surface soil by wind and surface water erosion.	Provides effective protection for over 130 years. Minimal environmental impacts during construction.	Eliminates contamination from site.	Eliminates contamination from site.	The treatment reduces the contaminant concentrations below the RGs.
Compliance with ARARs					
Action-specific					
Idaho Fugitive Dust Emissions-IDAPA 16.01.01.650 et seq.	Would not meet ARAR because no controls would be implemented	Will meet ARAR by eliminating potential for windblown soil contamination	Will meet ARAR by eliminating potential for windblown soil contamination	Will meet ARAR by eliminating potential for windblown soil contamination	Will meet ARAR by eliminating potential for windblown soil contamination both during and after treatment.
Idaho Hazardous Waste Management Act-IDAPA 16.01.05.005 et seq.	NA	NA	Soil samples would be collected and analyzed so wastes can be regulated as necessary	Soil samples would be collected and analyzed so wastes can be regulated as necessary	Plant samples would be collected and analyzed so wastes can be regulated as necessary
Idaho Hazardous Waste Management Act-IDAPA 16.01.05.006 et seq.	NA	NA	NA	NA	Plant samples will be tested by using approved methods to determine if the plant matter is hazardous waste.

Table 7-3. (continued).

Criteria	Alternative 1 No action	Alternative 3a Engineered cover	Alternative 4a: Conventional excavation and off-site disposal at INEEL Soil Repository or RWMC	Alternative 4b: Conventional excavation and off-site disposal at private facility	Alternative 5: Phytoremediation
General Requirements for shippers 49 CFR 173	NA	NA	Placards would be applied to the trucks during transport on-INEEL facility	Placards would be applied to the trucks and rail cars during transit to the off-INEEL facility.	Trucks used to transport the plant matterial will have the have the appropriate placards.
Nationcal Contingency Plan -Procedures for planning and implementing off-site response actions (40CFR 300.440)	NA	NA	NA	NA	If determined to be a hazardous waste, the ash from incinerated plant matter will be shipped off-site to a RCRA Subtitle C landfill which is operated in compliance with RCRA.
Chemical-specific					
NESHAPS-40 CFR 61.92	NA	Would meet ARAR by controlling the source term for all exposure pathways.	Would meet ARAR by eliminating the source term for all exposure pathways.	Would meet ARAR by eliminating the source term for all exposure pathways.	Would meet ARAR by treating the soils so the contaminants are below the RGs for all exposure pathways.
Rules for the Control of Air Pollution in Idaho-IDAPA 16.01.01.585 and .586	Would not meet ARAR if toxic metals or organics were present in fugitive dust, because no controls would be implemented.	Would meet ARAR through use of engineering controls.	Would meet ARAR by removing contamination from site.	Would meet ARAR by removing contamination from site.	Would meet ARAR by treatment to reduce the contamination to levels below the RGs.
Location-specific					
National Historic Preservation Act-16 USC 470	NA	These sites are in areas that are 50 years old in previously disturbed areas. If cultual artifacts are encountered, DOE will stop work and conduct a detailed survey of the area.	These sites are in areas that are 50 years old in previously disturbed areas. If cultual artifacts are encountered, DOE will stop work and conduct a detailed survey of the area.	These sites are in areas that are 50 years old in previously disturbed areas. If cultual artifacts are encountered, DOE will stop work and conduct a detailed survey of the area.	These sites are in areas that are 50 years old in previously disturbed areas. If cultual artifacts are encountered, DOE will stop work and conduct a detailed survey of the area.

7-11

Table 7-3. (continued).

Criteria	Alternative 1 No action	Alternative 3a Engineered cover	Alternative 4a: Conventional excavation and off-site disposal at INEEL Soil Repository or RWMC	Alternative 4b: Conventional excavation and off-site disposal at private facility	Alternative 5: Phytoremediation
To Be Considered					
Environmental Protection, Safety, and Health Protection Standards-DOE Order 440.1	Would not meet TBC because no controls would be implemented.	Would meet TBC through use of engineering and institutional controls and best management practices.	Would meet TBC through use of engineering controls and best management practices..	Would meet TBC through use of engineering controls and best management practices..	Would meet TBC through use of engineering controls and best management practices.
Radioactive Waste Management-DOE Order 5820.2A and new order 435.1 in FY 2000	Would not meet TBC because no controls would be implemented.	Would meet TBC through use of engineering and institutional controls and best management practices.	Would meet TBC through use of engineering controls and best management practices.	Would meet TBC through use of engineering controls and best management practices.	Would meet TBC through use of engineering controls and best management practices. Final disposal of plant matter after incineration.
Radiation Protection of the Public and Environment-DOE Order 231.1	Would not meet TBC because no controls would be implemented.	Would meet TBC through use of engineering and institutional controls and best management practices.	Would meet TBC through use of engineering controls and best management practices.	Would meet TBC through use of engineering controls and best management practices.	Would meet TBC through use of engineering controls and best management practices. Final incineration of biomass would be conducted in an approved facility.
Long-term effectiveness and permanence					
Magnitude of residual risk	No change from existing risk.	Source-to-receptor pathways eliminated while cap remains in place. Inherent hazards of inorganics would remain. Cs-137 within 1E-04 acceptable range after 130 years.	No reduction in contaminant concentrations. All contaminated soils would be removed from site and transported for disposal at another facility.	No reduction in contaminant concentrations. All contaminated soils would be removed from site and transported for disposal at another facility.	In-situ treatment of the soils would result in contaminant levels that are below the RGs.
Adequacy and reliability of controls	No control and, therefore, no reliability.	Limited access to contaminated soil and environmental monitoring effective only during institutional period of control (at least 100 years). Barrier control over contaminated soil for at least 130 years.	Disposal facility is assumed to provide adequate and reliable control over disposed soil and debris.	Disposal facility is assumed to provide adequate and reliable control over disposed soil and debris.	Phytoremediation treatment has been successfully used in mining applications. Contingency alternative could be selected if phytoremediation is not working at ANL-W.

7-12

Table 7-3. (continued).

Criteria	Alternative 1 No action	Alternative 3a Engineered cover	Alternative 4a: Conventional excavation and off-site disposal at INEEL Soil Repository or RWMC	Alternative 4b: Conventional excavation and off-site disposal at private facility	Alternative 5: Phytoremediation
Reduction of toxicity, mobility, or volume through treatment					
Treatment process used	NA	NA	NA	NA	Phytoremediation.
Amount destroyed or treated	NA	NA	NA	NA	All radioactively and inorganically contaminated soils above the RGs.
Reduction of toxicity, mobility, or volume	None	None	None	None	No reduction in toxicity, the most mobile contaminants will be removed, and no increase in volume of contaminated soil. The volume of biomass would be incinerated to reduce volume to be disposed.
Irreversible treatment	NA	NA	NA	NA	Yes
Type and quantity of residuals remaining after treatment	NA	NA	NA	NA	The soils remaining after treatment will contain contaminants below the RGs. The soil can be reused for any application such as farming, or community development.
Statutory preference for treatment	NA	NA	NA	NA	Treatment method is relatively new and more plant species are being tested for their affinity to bioaccumulate contaminants.
Short-term effectiveness					
Community protection	No increase in potential risks to the public.	No increase in potential risks to the public.	Slight increase in potential risks to the public during off-site transportation.	Slight increase in potential risks to the public during off-site transportation.	No increase in potential risks to the public.

Table 7-3. (continued).

Criteria	Alternative 1 No action	Alternative 3a Engineered cover	Alternative 4a: Conventional excavation and off-site disposal at INEEL Soil Repository or RWMC	Alternative 4b: Conventional excavation and off-site disposal at private facility	Alternative 5: Phytoremediation
Worker protection	No increase or decrease in potential risks to the worker.	Worker risk during barrier installation is minor due to shielding afforded by existing clean soil and engineering controls.	Worker risk is minimal after the soil is removed and meets the established RAOs.	Worker risk is minimal after the soil is removed and meets the established RAOs.	Worker risk from exposure to contaminated soil during farming activities will require administrative and engineering controls.
Environmental impacts	No change from existing conditions.	Limited to disturbances from vehicle and material transport activities associated with barrier construction. Limited potential for airborne contamination in the form of fugitive dust, due to use of engineering controls.	Limited to disturbances from vehicle and material transport activities associated with excavation. Limited potential for airborne contamination in the form of fugitive dust, due to use of engineering controls.	Limited to disturbances from vehicle and material transport activities associated with excavation. Limited potential for airborne contamination in the form of fugitive dust, due to use of engineering controls.	Limited increase in animal usage of the sites outside the ANL-W facility during the phytoremediation. Very small potential for airborne contamination in the form of fugitive dust, due to use of engineering controls and irrigation.
Time until action is complete	NA	Approximately 12 to 15 months.	Approximately 18 to 24 months.	Approximately 18 to 24 months.	Estimated to be 5 years based on the use of multiple plantings per field season.
<u>Implementability</u>					
Ability to construct and operate	No construction or operation.	Involves available construction technology.	Somewhat difficult, due to redundant and/or conflicting safety requirements for ANL-W and LMITCO.	Somewhat difficult, due to redundant and/or conflicting safety requirements rom both ANL-W and LMITCO. Potential scheduling problems because of rail shipment to off-site private facility.	Small farming equipment is readily available. Site application to select plant species, soil amenities, irrigation schedules, and disposal of biomass will be determined per field season.

Table 7-3. (continued).

Criteria	Alternative 1 No action	Alternative 3a Engineered cover	Alternative 4a: Conventional excavation and off-site disposal at INEEL Soil Repository or RWMC	Alternative 4b: Conventional excavation and off-site disposal at private facility	Alternative 5: Phytoremediation
Ease of implementing additional action if necessary	May require repeat of feasibility study/ record of decision process.	Additional remedial actions would be difficult, as the barrier is intended to prevent access to contamination. Barrier would require removal.	Shipment of the soil to an on-site disposal facility would require interaction between ANL-W and LMITCO that could cause delays in the schedule.	In addition to co-ordination between ANL-W and LMITCo, the off-site disposal facility would also have to be involved in the discussions and scheduling.	Use of this treatment technology would not inhibit the use of a different alternative later.
Ability to monitor effectiveness	Monitoring of conditions is readily implemented.	Barrier performance can be monitored through radiation surveys, and can be visually assessed on the basis of physical integrity.	The effectiveness in removing all contaminated materials associated with site is easily monitored.	The effectiveness in removing all contaminated materials associated with site is easily monitored.	The effectiveness in removing contaminants to levels below the RGs can be determined through sampling. Once the soil is treated future monitoring would not be required.
Ability to obtain approvals and coordinate with regulatory agencies	No approvals required.	No difficulties identified.	Potentially difficult, due to additional requirements for environmental assessments, safety analyses, and ARARs compliance.	Potentially difficult, due to additional requirements for environmental assessments, safety analyses, and ARARs compliance.	No difficulties identified.
Availability of services and capacity	None required.	Barrier design and services reside within the DOE and are considered readily available to the INEEL.	Services available either onsite or offsite through subcontractor.	Services available either onsite or offsite through subcontractor.	Services available either onsite or offsite through subcontractor.
Availability of equipment, specialists, and materials	None required	Equipment and materials are readily available at the INEEL or within surrounding communities.	Equipment and materials are either available onsite, through subcontractors or will be purchased. Trained specialists are available within the communities surrounding the INEEL.	Equipment and materials are either available onsite, through subcontractors or will be purchased. Trained specialists are available within the communities surrounding the INEEL.	Equipment and materials are either available onsite or through subcontractors.
Availability of technology	None required	Readily available at the INEEL.	Readily available at the INEEL.	Readily available at the INEEL.	Readily available at ANL-East with experienced personnel.
<u>Cost (present worth)</u>					
	See Table 9-2	See Table 9-2	See Table 9-2	See Table 9-2	See Table 9-2

NA = Not Applicable

7-15

Table 7-4. Comparative Analysis of Remedial Alternatives.

Evaluation Criteria	Alternative				
	3a	**4a[1]**	**4a[2]**	**4b**	**5**
Overall Protection of Human Health and the Environment	Meets	Meets	Meets	Meets	Meets
Compliance with Applicable and Relevant and Appropriate Requirements	◗	◗	◗	◗	●
Long-term Effectiveness and Permanence	○	◗	◗	◗	●
Short Term Effectiveness	○	◗	◗	◗	◗
Reduction of Toxicity, Mobility, or Volume Through Treatment	○	○	○	○	●
Implementability	●	●	●	●	◗
Cost (in millions)	7.6	5.9	5.9	13.1	2.8

● = Best ◗ = Good ○ = Worst

[1] - Using RWMC.
[2] - Using the Proposed INEEL Soils Repository at WAG 3.

7.3.1.1 Overall Protection of Human Health and the Environment

The primary measure of this criterion is the ability of an alternative to achieve RAOs for the sites. Since this is a threshold criterion, each alternative must be able to meet the RAOs in order for the alternative to be retained. Alternatives 4a, 4b, and 5 meets the criteria and would provide the best long-term protection of human health and the environment because the soils would be removed from WAG 9 (Alternatives 4a and 4b) or the concentrations would be reduced to acceptable levels (Alternative 5). Alternatives 4a and 4b (conventional excavation and landfill disposal) would accomplish this by removing the contaminated soil from the ANL-W site. Alternative 3a (engineered landfill at WAG 9) meets the criteria because it would not prevent unacceptable exposure to cesium-137 after the 100-year DOE control period. Alternative 1 (no action) would not prevent exposures resulting in risks greater than 1E-04, and is therefore eliminated from further consideration.

7.3.1.2 Compliance with Applicable or Relevant and Appropriate Requirements

Compliance with ARARs is also a threshold criterion. Each alternative must be able comply with all ARARs in order for the alternative to be retained. For this criterion Alternative 5 is ranked the highest because the planting, harvesting and irrigating of the contaminated soils would result in no emissions of fugitive dust. Alternatives 3a, 4a, and 4b are ranked equally, since all are considered equally capable of achieving compliance through use of engineering controls to meet the State of Idaho regulations for controlling emissions of fugitive dust and toxic substances. Alternatives 3a, 4a, and 4b are also ranked equally in compliance with other ARARs.

7.3.2 Balancing Criteria

Once an alternative satisfies the threshold criteria, five balancing criteria are used to evaluate other aspects of the remedial alternatives and weigh major tradeoffs among alternatives. The balancing criteria are used in refining the selection of the candidate alternatives for the site. The balancing criteria are: (1) long-term effectiveness and permanence; (2) reduction in toxicity, mobility, or volume through treatment; (3) short-term effectiveness; (4) implementability; and (5) cost.

7.3.2.1 Long-term Effectiveness and Permanence

Alternative 5 would provide the highest degree of long-term effectiveness and permanence, because the contamination would have been reduced to acceptable levels for this criterion. Alternative 4a and 4b provide the next highest degree of long-term effectiveness and permanence, because contaminated soil exceeding cleanup goals would no longer exist at the sites. Alternative 3a would be effective as long as the cap prevents human and biotic intrusion and controls erosion and leaching of contaminants.

7.3.2.2 Reduction in Toxicity, Mobility, or Volume Through Treatment

Alternative 5 is the only treatment alternative that provides reduction in toxicity mobility or volume through treatment. In addition to removing the contaminants from the soil, Alternative 5 also reduces the volume of contaminants to be disposed. For phytoremediation, a large reduction in volume is anticipated by incineration of the plant matter, incineration, and solidification of the ash as compared to excavation and disposal of the contaminated soil. The other alternatives were ranked the lowest since they do not reduce the toxicity, mobility, or volume of the contaminated soils through treatment. However, Alternative 3a, 4a, and 4b do reduce the toxicity and mobility of the contaminants through containment.

7.3.2.3 Short-term Effectiveness

These WAG 9 sites are not located near inhabited areas and no public roads are in the vicinity. Thus, no significant impacts to surrounding communities would be anticipated from exposure to contaminants during remediation in the WAG-9 sites. However, there is a potential short-term impact to workers who will be conducting the remedial action. Alternatives 4a, 4b, and 5 are equally ranked and are higher than Alternative 3a, because the wastes would remain on site or would only have to be moved once. Alternative 3a is ranked the lowest because the soils would have to be handled twice, once for the removal from the ditches and once when the soils are consolidated into the cap.

7.3.2.4 Implementability

Each of the alternatives retained for detailed analysis is technically implementable. The relative ranking of the alternatives with respect to implementability is shown in Table 7-4. Alternatives 3a, 4a, and 4b are equally ranked because they will require the procurement of a contractor to perform the excavation, construction, transport of equipment, permits, and coordination with other on-site and off-site contractors. These permits would consist of safe work permits, digging permits, radiation safe work permits, and transportation placards. Alternative 5 is ranked the lowest because of the unknowns associated with it meeting the RAOs within a cost effective time frame. The potential success of Alternative 5 will be determined through bench-scale and field testing. If Alternative 5 is utilized, ANL-W personnel can plant and harvest the phytoremediation plants and farming equipment is available locally.

7.3.2.5 Cost

Separate line item costs are developed for the primary components of each remedial action alternative, such as monitoring; capping; excavation; disposal; and reporting requirements such as remedial design/remedial action scope of work, remedial design/remedial action work plans, safety documentation, and progress reports. The estimated present worth cost of each alternative is shown in Table 9-3 and the relative ranking for this criterion is shown in Table 7-4.

7.3.3 Modifying Criteria

The modifying criteria, state and community acceptance, are used in the final evaluation of remedial alternatives. For both of these criteria, the factors include the elements of the alternatives that have strong opposition.

7.3.3.1 State Acceptance

The IDHW has been involved in the development and review of the RI/FS report, the Proposed Plan, and this ROD. All comments received from IDHW on these documents have been resolved and incorporated into these documents accordingly. In addition, IDHW has participated in public meetings where public comments and concerns have been received and responses offered.

The IDHW concurs with the selected remedial alternative of phytoremediation for the eight areas that have been identified for remedial action, as well as the 33 No Action sites in this ROD. The IDHW is signatory to the ROD with DOE and EPA.

7.3.3.2 Community Acceptance

Community participation in the remedy selection process includes participation in the public meetings held in January 1998 and review of the Proposed Plan during the public comment period of January 12 through March 12, 1998. Community acceptance is summarized in the Responsiveness Summary presented as Appendix A of this document. The Responsiveness Summary includes comments received either verbally or in writing from the public, and the agencies' responses to these comments.

As shown in the Responsiveness Summary, most of the public agreed with the selection of Alternative 5, phytoremediation to clean up the eight areas at ANL-W. The commentors also expressed concern over the possible selection of non-native plants, possible increased exposure to ecological receptors that may browse on the plants, and incineration and ash disposal issues. The agencies have addressed these comments and, where applicable, have incorporated these comments into this ROD. Other comments will be addressed during implementation and interpretation of the phytoremediation bench-scale greenhouse testing. The agencies appreciate the public's participation in this process and acknowledge the value of the public comment.

8 SELECTED REMEDY

The results of investigations and risk assessments at WAG 9, OU 9-04, at INEEL indicate that eight areas pose unacceptable risks to human health and/or the enviornment. Two areas have human heath carcinogenic risks greater than 1 in 10,000 (1E-04), five areas have unacceptable HQs greater than 10 times the HQ for INEEL background, and one area has both human and ecological risks. The investigation also showed that 33 FFA/CO sites do not exceed a 1E-04 carcinogenic risk or have HQ less than the 10 times the HQ for INEEL background, and therefore require no action. It is important to note that there are no unacceptable cumulative effects from the WAG 9 sites, and the remedial actions being recommended address individual risks as well as prevent cumulative risks to a future residential receptor at WAG 9. Based on consideration of the requirements of CERCLA, the detailed analysis of alternatives, and public comments, DOE, EPA, and IDHW have a selected and a contingent alternative for remediation of the sites contained in this ROD. The justification for the selection of the remedial alternatives is discussed in the following sections.

8.1 Ranking of Alternatives

Table 7-4 provides a summary of how the alternatives rank relative to one another. This comparative analysis provides a measure of the relative performance of alternatives against each evaluation criterion. The purpose of this comparison is to identify the relative advantages and disadvantages associated with each alternative.

Although the contaminated soil types (radiologically- and inorganically-contaminated soil) were evaluated separately against the evaluation criteria, both soil types produced similar rankings of the remedial alternatives. The overall ranking order of the alternatives is 5, 4a, 3a, and 4b. Thus, the information presented in the following paragraph presents the results of the ranking of soil types along with the justification for the selected alternative.

Each of the retained alternatives with the exception of the no action alternative (Alternative 1), would meet the remedial action objectives associated with the protection of human health and the environment. Alternative 1, No Action, does not meet the threshold criteria of overall protection of human health and the environment, but it serves as a baseline to determine the benefits of the other alternatives. Alternative 2, Limited Action and Alternative 3b, Native Soil Cap were screened prior to the detailed analysis of the alternatives because they do not meet the threshold criteria of overall protection of human health and the environment. However, certain limited action items such as access restrictions, land use restrictions, and monitoring are employed in Alternatives 3a, 4a, and 5. Alternatives 3a, 4a, and 4b meet all the remedial action objectives and provide overall protection of human health and the environment. But, these alternatives do not use treatment to reduce the toxicity, mobility, or volume of the contaminants. They do however eliminate the potential exposure of human and ecological receptors to the contaminants. Although Alternatives 3a, 4a, and 4b use similar containment technology to reduce the exposure of the contaminants to humans and the environment, Alternative 4a was ranked higher than Alternatives 3a and 4b because of the lower present value costs. Alternative 5 is the only alternative that reduces the toxicity, mobility, and volume of the contaminated media through treatment. In addition, it is anticipated that the costs of using phytoremediation are less than the costs of Alternatives 3a, 4a, and 4b. Alternative 5 can be used for both radiologically and inorganically contaminated soils and provides a barrier against windblown contamination. Alternative 5 best meet the first seven evaluation criteria and is therefore the preferred alternative. Alternative 5, reduces the mass of contaminated material that must be disposed of to less then one percent of the mass of the contaminated soil. After the anticipated five field seasons for phytoremediation, the concentrations of contaminants in the soils should meet the established RAOs and the soils will remain under land use and access restrictions until they can be released for unlimited used. DOE anticipates that this wil be in approximately 100 years from now (2098).

8.2 Selected Remedy

The selected remedial remedy for the eight WAG 9 areas with unacceptable risks to human health and/or the environment is Alternative 5, phytoremediation. This alternative is the only alternative that offered a permanent solution for reduction of the toxicity, mobility, or volume of the contaminated material through treatment. This alternative is protective of human health and the environment, was ranked the best for three of the five modifying criteria including; long-term permanence, reduction of toxicity, mobility, or volume, and cost, and received generally favorable comments from the IDHW and public during the public involvement process. Monitoring of the soil, groundwater, and vegetation will continue for 20 years (2018) approximately 15 years after the RGs are met for each site in accordance with DOE Orders and the ANL-W Environmental Monitoring Plan, (ANL-W, 1998). The soil, groundwater, and vegetation monitoring results collected semi-annually will determine trends of low level radionulcide and inorganic contaminant levels around the ANL-W facility. After the RGs are met, CERCLA 5 year reviews would be required to ensure that the assumption of DOE control of the INEEL lands is still applicable. DOE anticipates that these five-year reviews will consist of a memorandum summarizing a checklist-driven inspection of the signs, fences, and other physical features that assure that DOE administrative controls are still in place. Phytoremediation would not be initiated on the Sanitary Sewage Lagoons because they will remain in service until approximately the year 2033 when the facility is scheduled for closure. Likewise, the Industrial Waste Pond phytoremediation will not be initiated until the cooling water discharges from the Sodium Processing Facility are completed. The final sodium cooling water discharges are currently planned for 2002. This delay in phytoremediation startup does not pose any unacceptable risks to human health and or the environment since these sites would be in a wetted condition. The major components of the selected remedy for ANL-W are:

- Completion of the phytoremediation workplan for the bench-scale testing

- Conducting a bench-scale phytoremediation test of selected plant species at the sites that pose unacceptable risks

- Determine effectiveness and implementability of phytoremediation based on results of bench-scale testing

- Collecting and analyzing of soil and plant samples from the two-year field season to determine the effectiveness of phytoremediation on the ANL-W soils insitu

- Harvesting, compacting, incinerating, and disposing of the above and below ground plant matter in a permitted landfill

- Continue planting/harvesting process until RAOs are attained if the two-year field-scale testing is successful

- Installing access restrictions consisting of fences, bird netting, and posting warning signs

- Review of the selected remedy no less than every five years until the RAOs have been met

- Implementation of DOE controls which limit residential land use for at least 100 years from now (2098).

Implementation of this alternative will increase the short-term human and ecological exposure to the contaminants. These short-term increases in exposure are estimated to last for five years and will ultimately reduce the long-term exposure of the contaminants to humans or the ecological receptors. Engineering controls will be used to reduce the short-term exposures to the human workers, while fencing, covering, and harvesting methods will be optimized to reduce the short-term exposure to the ecological receptors. These engineering controls will be further detailed and described in the RD Work Plan for WAG 9.

In summary, phytoremediation has been selected as the remedial alternative for cleanup of the eight areas at WAG 9 that pose unacceptable risks. Phytoremediation is an innovative treatment technology that appears to be the most appropriate remedy for WAG 9. However, bench-scale greenhouse testing and insitu field testing is needed to verify the technology's applicability for use on WAG 9 soils. The bench-scale greenhouse tests are currently being conducted and the results will indicate if the uptake rates are too low, or if it would take too long to meet the RGs. The results of the bench-scale greenhouse testing will determine if the selected remedial remedy will be replaced with the more conventional contingent alternative.

8.3 Selected Contingent Remedy

Alternative 4a, excavation and disposal at an on-INEEL facility has been selected as the contingent remedial remedy for the eight areas that pose unacceptable risks to human health and the environment. This contingent remedial alternative has been selected because it offers a proven technology to meet the RGs. This contingent remedy would be implemented if the selected remedial remedy (phytoremediation) does not prove adequate for use on the WAG 9 soils. Alternative 4a involves the physical removal of the contaminated soil at the eight areas at WAG 9. The soils will be transported to either the proposed INEEL Soils Repository or the RWMC facility. The final determination of which of these two facilities would be used will be determined during the remedial design phase after the ROD has been signed. The excavation with on-INEEL disposal alternative offers the highest degree of implementability and the second lowest costs of the retained alternatives. It is estimated that the excavation and disposal will take two years to complete after being initiated. DOE will continue soil, air, and groundwater monitoring for 20 years from now (to 2018) for the ANL-W site in accordance with DOE Orders and the ANL-W Environmental Monitoring Plan, (ANL-W, 1998). The soil, groundwater, and vegetation monitoring results collected semi-annually will determine trends of low level radionulcide and inorganic contaminant levels around the ANL-W facility. After the remediation goals are met, CERCLA 5 year reviews would be required to ensure that the assumption of DOE control of the INEEL lands is still applicable. DOE anticipates that these five-year reviews will consist of a memorandum summarizing a checklist-driven inspection of the signs, fences, and other physical features that assure that DOE administrative controls are still in place. The major components of the contingent remedy for ANL-W are:

- Contaminants in the waste areas will be excavated and transported to either the RWMC or the INEEL Soils Repository for on-INEEL disposal
- Verification sampling would be used to validate that the remaining soil concentrations are below the RAOs
- Review of the remedy no less than every five years until the RAOs have been met
- Implementation of DOE controls which limit residential land use for at least 100 years from now (2098).

The No action alternative is reaffirmed and selected as the appropriate alternative for the remaining 33 areas at the ANL-W facility. These 33 areas have risks that are at acceptable levels based on the information gathered during the remedial investigation.

The possibility exists that contaminated environmental media not identified by the INEEL FFA/CO or in this comprehensive investigation will be discovered in the future as a result of routine operations, maintenance activities, and decontamination and dismantlement activities at ANL-W. Upon discovery of a new contaminant source by DOE, IDHW, or EPA, that contaminant source will be evaluated and appropriate response action taken in accordance with the FFA/CO.

8.4 No Action Sites

The No Action alternative was reaffirmed as the appropriate alternative for 35 areas, 33 areas from WAG 9 and two sites from WAG 10. This alternative was chosen because there are no known or suspected contaminant releases, contaminants exceeding acceptable levels, or previous cleanups resulted in acceptable risks to human health and the environment. For this reason, long-term environmental monitoring is not warranted for these sites. It should be noted that these 36 No Action sites do not pose a cumulative risk. These 35 areas are listed below.

Operable Unit-None

- ANL-10 Dry Well between T-1 and ZPPR Mound
- ANL-11 Waste Retention Tank 783 (never used)
- ANL-12 Suspect Waste Retention Tank by 793 (removed 1979)
- ANL-14 Septic Tank and Drain Fields (2) by 753 (tank removed 1979)
- ANL-15 Dry Well by 768
- ANL-16 Dry Well by 759 (2)
- ANL-17 Dry Well by 720
- ANL-18 Septic Tank and Drain Field by 789 (removed 1979)
- ANL-20 Septic Tank and Leach Field by 793
- ANL-21 TREAT Suspect Waste tank and Leaching Field (non-radioactive)
- ANL-22 TREAT Septic Tank and Leaching Field
- ANL-23 TREAT Seepage Pit and Septic Tank W of 720 (filled 1980)
- ANL-24 Lab and office Acid Neutralization Tank

- ANL-25 Interior Building Coffin Neutralization Tank
- ANL-26 Critical Systems maintenance Degreasing Unit
- ANL-32 TREAT Control Building 721 Septic Tank and Leach Field (present)
- ANL-33 TREAT Control Building 721 Septic Tank and Seepage Pit (removed 1978)
- ANL-27 Plant Services Degreasing Unit

Operable Unit-9-01

- ANL-19 Sludge Pit W of T-7 (Imhoff Tank) (filled in 1979)
- ANL-28 EBR-II Sump (regeneration)
- ANL-29 Industrial Waste Lift Station
- ANL-30 Sanitary Waste Lift Station
- ANL-36 TREAT Photo Processing Discharge Ditch
- ANL-60 Knawa Butte Debris Pile
- ANL-61 EBR-II Transformer Yard
- ANL-62 Sodium Boiler Building (766) Hotwell
- ANL-63 Septic Tank 789-A

Operable Unit-9-02

- ANL-08 EBR-II Leach Pit (radioactive)

Operable Unit-9-03

- ANL-05 ANL Open Burn Pits #1 #2 and #3
- ANL-31 Industrial/Sanitary Waste Lift Station (industrial side not used)
- ANL-34 Fuel Oil Spill by building 755

Operable Unit-9-04

- ANL-01 Only the Ditch C portion of ANL-01
- ANL-53 Cooling Tower Riser Pits

Operable Unit-10-06

- ANL-W Stockpile site
- ANL-W Windblown Area

8.5 Remediation Goals

The purpose of selecting a remedial response action in this ROD is to formally document the remedial alternative and contingent alternative that will be implemented at WAG 9. The successful completion of the remediation technology will reduce the contaminant risks to acceptable levels for the human and environmental receptors. For the eight areas that require an action, phytoremediation is the selected treatment technology. Excavation and disposal has been selected as the contingent remedial alternative. The RGs are the same for either remedial alternative selected. These RGs are shown in Table 7-1 for each of the eight areas at ANL-W. Confirmation soil samples will be collected after the phytoremediation field seasons, or after excavation and disposal in order to ensure that the cleanup meets or exceeds the RGs.

8.6 Estimated Cost Details for the Selected Remedy

A summary of the costs for each of the alternatives retained for detailed analysis are shown in Tables 8-1 through 8-6. Table 9-3 shows the estimated costs for all the alternatives that met the threshold criteria for protection of human health and the environment.

Table 8-1. Detailed Cost Estiamte Summary Sheet for Alternative 3, Containment.

Cost Elements			Estimated Costs ($)
WAG 9 Management Costs			
CERCLA RD/RA Oversight	**Subtotal**		**$1,526,974**
Documentation Package			
Site surveying		$	47,250
Final Design Bid Package		$	7,000
Safety Analysis Report		$	8,750
Verification Sampling Plan		$	7,000
Verification Sampling Costs		$	10,500
Safe Work Permit		$	3,500
Radiation Work Permit		$	3,500
Excavation Permit		$	3,500
RCRA Subtitle D Landfill Application		$	35,000
	Subtotal		**$126,000**
Construction Costs			
Mobilization and Demobilization		$	70,000
Construction of Base		$	1,161,944
Density Testing of Base		$	7,000
Soil Removal		$	1,161,944
Backfill Site to Grade		$	1,619,444
Re-vegetation		$	192,350
Cap Construction		$	958,000
WAG 9 Construction Oversight		$	70,000
Fencing		$	150,600
Surface Water Diversion		$	30,120
	Subtotal		**$4,963,913**
Operations and Maintenance Costs			
Post-closure Management		$	812,500
Monitoring		$	1,196,000
WAG 9, Five-year Reviews		$	338,000
	Subtotal		**$2,346,500**
Total in 1998 dollars		**$**	**8,963,387**
Total in Net Present Value dollars*		**$**	**7,580,000**

* Net present value costs are determined by taking the cost estimates for performing the work in 1998 and assumes a constant 5% inflation rate to determine the projected future costs between 1999 and 2098. The total of these future costs are then totaled and a 5% discount rate is applied to determine the net present value.

Table 8-2. Detailed Cost Estimate Summary Sheet for Alternative 4a, Excavation and Disposal at the INEEL Soils Repository.

Cost Elements		Estimated Costs ($)	
WAG 9 Management Costs			
CERCLA RD/RA Oversight	**Subtotal**		**$1,232,496**
Documentation Package			
Site surveying		$	31,500
Final Design Bid Package		$	7,000
Safety Analysis Report		$	8,750
Verification Sampling Plan		$	7,000
Verification Sampling Costs		$	10,500
Safe Work Permit		$	3,500
Radiation Work Permit		$	3,500
Excavation Permit		$	3,500
Waste Acceptance Report to LMITCO		$	52,500
	Subtotal		**$127,750**
Construction Costs			
Mobilization and Demobilization		$	70,000
Soil Removal		$	1,161,944
Soil Transport to INEEL Repository		$	1,161,944
Tipping Fee/cy		$	232,388
Backfill Site to Grade		$	1,619,444
Re-vegetation		$	192,350
	Subtotal		**$4,438,070**
Operations and Maintenance Costs			
Post-closure Management		$	203,125
Monitoring		$	239,200
WAG 9, Five-year Reviews		$	338,000
	Subtotal		**$780,325**
Total in 1998 dollars		**$**	**6,578,641**
Total in Net Present Value dollars*		**$**	**5,876,000**

* Net present value costs are determined by taking the cost estimates for performing the work in 1998 and assumes a constant 5% inflation rate to determine the projected future costs between 1999 and 2098. The total of these future costs are then totaled and a 5% discount rate is applied to determine the net present value.

Table 8-3. Detailed Cost Estimate Summary Sheet for Alternative 4a, Excavation and Disposal at RWMC.

Cost Elements			Estimated Costs ($)
WAG 9 Management Costs			
CERCLA RD/RA Oversight	**Subtotal**		**$1,232,496**
Documentation Package			
Site surveying		$	31,500
Final Design Bid Package		$	7,000
Safety Analysis Report		$	8,750
Verification Sampling Plan		$	7,000
Verification Sampling Costs		$	10,500
Safe Work Permit		$	3,500
Radiation Work Permit		$	3,500
Excavation Permit		$	3,500
Waste Acceptance Report to LMITCO		$	52,500
	Subtotal		**$127,750**
Construction Costs			
Mobilization and Demobilization		$	70,000
Soil Removal		$	1,161,944
Soil Transport to RWMC		$	1,549,259
Tipping Fee/cy		$	0
Backfill Site to Grade		$	1,619,444
Re-vegetation		$	192,350
	Subtotal		**$4,592,997**
Operations and Maintenance Costs			
Post-closure Management		$	203,125
Monitoring		$	239,200
WAG 9, Five-year Reviews		$	338,000
	Subtotal		**$780,325**
Total in 1998 dollars		**$**	**6,733,568**
Total in Net Present Value dollars*		**$**	**6,110,000**

* Net present value costs are determined by taking the cost estimates for performing the work in 1998 and assumes a constant 5% inflation rate to determine the projected future costs between 1999 and 2098. The total of these future costs are then totaled and a 5% discount rate is applied to determine the net present value.

Table 8-4. Detailed Cost Estimate Summary Sheet for Alternative 4b, Excavation with Disposal at Private Faciltiy.

Cost Elements			Estimated Costs ($)
WAG 9 Management Costs			
CERCLA RD/RA Oversight	**Subtotal**		**$2,905,696**
Documentation Package			
Site surveying		$	31,500
Final Design Bid Package		$	7,000
Safety Analysis Report		$	8,750
Verification Sampling Plan		$	7,000
Verification Sampling Costs		$	10,500
Safe Work Permit		$	3,500
Radiation Work Permit		$	3,500
Excavation Permit		$	3,500
Waste Acceptance Report to LMITCO and Private Faciltiy		$	52,500
	Subtotal		**$127,750**
Construction Costs			
Mobilization and Demobilization		$	70,000
Soil Removal		$	1,161,944
Soil Transport to Railyard		$	1,161,944
Tipping Fee/cy		$	5,422,407
Backfill Site to Grade		$	1,619,444
Re-vegetation		$	192,350
	Subtotal		**$9,628,089**
Operations and Maintenance Costs			
Post-closure Management		$	203,125
Monitoring		$	239,200
WAG 9, Five-year Reviews		$	338,000
	Subtotal		**$780,325**
Total in 1998 dollars		**$**	**13,441,860**
Total in Net Present Value dollars*		**$**	**13,126,000**

* Net present value costs are determined by taking the cost estimates for performing the work in 1998 and assumes a constant 5% inflation rate to determine the projected future costs between 1999 and 2098. The total of these future costs are then totaled and a 5% discount rate is applied to determine the net present value.

Table 8-5. Detailed Cost Estimate Summary Sheet for Alternative 5, Phytoremediation.

Cost Elements		Estimated Costs ($)	
WAG 9 Management Costs			
CERCLA RD/RA Oversight	**Subtotal**		**$528,259**
Documentation Package			
Site surveying		$	8,400
Final Design Bid Package		$	7,000
Safety Analysis Report		$	8,750
Verification Sampling Plan		$	7,000
Verification Sampling Costs		$	21,000
Safe Work Permit		$	3,500
Radiation Work Permit		$	3,500
Excavation Permit		$	3,500
Waste Acceptance Report to LMITCO		$	35,000
	Subtotal		**$97,650**
Construction Costs			
Specialized Equipment Cost		$	300,000
Prepare Soil for Planting		$	28,852
Planting/growing season		$	28,852
Irrigating/growing season		$	57,705
Fertilizing/growing season		$	14,426
Harvesting/growing season		$	28,852
Bailing/growing season		$	28,852
Rad Surveys/growing season		$	12,022
Transport to INEEL WERF Incinerator/season		$	28,852
Additional Four Year Phyto Costs		$	913,662
Fencing		$	150,600
Surface Water Diversion		$	30,120
	Subtotal		**$1,622,795**
Operations and Maintenance Costs			
Post-closure Management		$	203,125
Monitoring		$	239,200
WAG 9, Five-year Reviews		$	338,000
	Subtotal		**$780,325**
Total in 1998 dollars		**$**	**3,029,029**
Total in Net Present Value dollars*		**$**	**2,824,000**

* Net present value costs are determined by taking the cost estimates for performing the work in 1998 and assumes a constant 5% inflation rate to determine the projected future costs between 1999 and 2098. The total of these future costs are then totaled and a 5% discount rate is applied to determine the net present value.

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9 STATUTORY DETERMINATIONS

The selected and contingent remedy for remediation of the eight WAG 9 areas meets the statutory requirements for CERCLA § 121, the regulations contained in the NCP, and the requirements of the FFA/CO for the INEEL. Both remedies meet the threshold criteria established in the NCP (i.e., protection of human health and the environment and compliance with ARARs). CERCLA also requires that the remedy use permanent solutions and alternative treatment technologies, to the maximum extent practical, and that the implemented action be cost effective. Finally, the statute includes a preference for remedies that employ treatment to permanently and significantly reduce the toxicity, mobility, or volume through treatment.

Phytoremediation works well for sites that have relatively shallow contamination over a large area at concentrations slightly above the cleanup levels. This is the case for the eight areas at WAG 9. Two of these areas that have low levels of radionuclide contamination, five areas have slightly elevated levels of inorganics, and one area has both low levels of radionuclides and inorganics. It is anticipated after the remedial action, none of the 39 total sites at WAG 9 will have contaminated soils and sediments left in place at levels associated with a risk greater than 1E-04 or a hazard quotient greater that 10 times the background hazard quotient. However, after the remediation goals are met, CERCLA 5 year reviews would be required to ensure that the assumption of DOE control of the INEEL lands is still applicable.

9.1 Protection of Human Health and the Environment

As previously described in Section 8, both the selected phytoremediation and the contingent excavation and disposal remedies can meet the RGs described in Table 7-1 that ensure protection of human health and the environment. The phytoremediation alternative will utilize treatment to remove contaminants from soils to levels at or below the RGs. While the contingent alternative excavation with on-INEEL disposal, will ensure protection of human health and the environment by physically removing the contaminated soil to levels below the RGs.

9.2 Compliance with ARARs and To Be Considered

Applicable requirements are those cleanup standards, standards of control, and other substantive environmental protection requirements, criteria, or limitations promulgated under federal or state law which specifically address a hazardous substance, pollutant, contaminant, remedial action, location, or other circumstance at a CERCLA site. Relevant and appropriate requirements are those same standards mentioned for applicable requirements, except while not applicable at the CERCLA site, address problems or situations sufficiently similar to those encountered at the site such that their use is well suited to the particular site.

Three types of ARARs exist: location-specific, action-specific, and chemical-specific. In general, location-specific ARARs place restrictions on the concentration of hazardous substances or the conduct of activities solely because they occur in special locations. Action-specific ARARs are usually technology or activity based requirements or limitations on actions or conditions involving specific substances. Chemical-specific ARARs are health or risk-based numerical values or methodologies that result in the establishment of numerical values. The values establish the acceptable concentrations of chemicals or substances that may be found in or discharged to the environment.

Documents that are not legally binding are identified as To-Be-Considered (TBC) guidance or procedures documents. Both the selected phytoremediation and the contingent excavation and on-INEEL disposal facility meet the TBC procedures or guidance documents that were identified by the agencies. The following two sections identify the specific ARARs and TBCs that were considered for the selected and contingent alternatives to be remediated at WAG 9.

9.2.1 Selected Remedy Compliance with ARARs

Implementation of phytoremediation remedy will be designed to comply with all chemical-, action-, and location-specific Federal and State ARARs, and TBCs as shown in Table 9-1. Table 9-1 lists each the ARAR statutes, specific citation reference, reason why the ARAR is retained, relevancy, and how DOE will attain compliance with the ARAR. In addition to including the ARARs in Table 9-1, the TBCs are also included. For the ANL-W facility, the TBCs consist of DOE Orders which act as guidance documents for work practices at DOE facilities. These DOE Orders are TBCs and are used in the absence of applicable state or federal regulations. As shown in Table 9-1, all of the ARARs and TBCs for the selected phytoremediation remedy can be met.

Other Federal and State laws are not included as ARARs for WAG 9 but may be invoked during future phases of the phytoremediation remedy. The future phases involve the disposal of ash at the Waste Experimental Reduction Facility (WERF) from the incineration of the contaminanted plant matter generated during phytoremediation. The resultant ash will be tested and depending on the results, either be disposed of at an approved Hazardous waste Treatment, Storage, and Disposal facility or a subtitle D landfill. The sampling and disposal of the incinerated ash will be conducted under the standard operating procedures outlined in the latest revision of the Reusable Property, Recyclable Materials, and Waste Acceptance Criteria (RRWAC) document. The two action-specific laws, IDAPA 16.01.05.008 (40 CFR 264) -"Standards for Owners and Operators of Hazardous Waste Treatment, Storage and Disposal facilities" and IDAPA 16.01.05.011 (40 CFR 268)-"Land Disposal Restrictions" have not been included as ARARs but may become applicable to the disposal facility if the incinerated ash is found to be a land disposal restricted hazardous waste. Another action specific law, IDAPA 16.01.05.006 (40 CFR 262.34) "Accumulation of Waste" may become applicable if plant matter is determined to be a hazardous waste, and if a large quantity of plant matter must be accumulated at ANL-W prior to shipping. One chemical-specific law, IDAPA 16.01.11.200-Idaho Groundwater Quality Rule" has not been included as an ARAR but may become applicable if future groundwater concentrations exceed those levels that were predicted in the OU 9-04 Comprehensive RI/FS. Currently DOE does not exceed any of these regulated groundwater concentrations at WAG 9 and does not expect to exceed them in the future. However, DOE will continue with groundwater monitoring in accordance with the ANL-W Environmental Monitoring Program.

9.2.2 Contingent Remedy Compliance with ARARs

Implementation of the contingent remedy of excavation with on-INEEL disposal will comply with all chemical-, action-, and location-specific Federal and State ARARs, and TBCs as shown in Table

Table 9-1. Evaluation of ARARs and TBC compliance for the selected remedy- Alternative 5: phytoremediation.

ARAR Statute	Citation	Reason	Relevancy	Attained by
Action				
Idaho Fugitive Dust Emissions	IDAPA 16.01.01.650	To control dust during excavation/farming operations.	Applicable	Application of water and/or chemical dust suppressants to land disturbed by excavation and/or farming operations.
Idaho Hazardous Waste Management Act	IDAPA 16.01.05.005 (40 CFR 261)—"Identification and Listing of Hazardous Waste"	All plant materials will need to be sampled for hazardous materials prior to shipment to an incinerator.	Applicable	Plant material samples will be collected and analyzed to determine if the plant matter is regulated hazardous waste.
Idaho Hazardous Waste Management Act	IDAPA 16.01.05.006 (40 CFR 262.11)—"Hazardous Waste Determination"	All waste that could potentially contain hazardous constituents must be sampled using approved methods.	Applicable	Plant material samples will be tested using approved EPA methods to determine if the plant matter is regulated as a hazardous waste.
General Requirements for Shippers	49 CFR 173	DOE will have to comply with the requirements for packaging and transporting of radioactive and hazardous material to an incinerator.	Applicable	These packaging and transportation regulations will be met by placing the waste in appropriate shipping container and applying the appropriate placards.
National Contingency Plan - Procedures for planning and implementing off-site response actions	40 CFR 300.440	The statute will apply if incinerated ash is a RCRA regulated hazardous waste and is shipped off-site for disposal.	Applicable	If determined to be a hazardous waste, the ash will be shipped off-site to a RCRA Subtitle C landfill which is operated in compliance with RCRA.
Chemical				
NESHAPS-Radionuclides other than Radon-222 and Radon-220 at DOE facilities-Emission Standard	40 CFR 61.92	Limits the exposure of radioactive contaminant release to 10 mrem/year for the off-site receptors.	Applicable	Monitors for airborne radionuclides are currently installed around the ANL-W facility and can be supplemented with additional portable monitors if necessary. Dust control measures will also help limit the release of radioactive contaminants.

Table 9-1. (Continued).

ARAR Statute	Citation	Reason	Relevancy	Attained by
Rules for the Control of Air Pollution in Idaho	IDAPA 16.01.01.585 and 586	Idaho rules governing the release and verification of carcinogenic and noncarcinogenic contaminants into the air.	Applicable	The phytoremediaiton will add live vegetation as a soil cover material that will prevent the release of dust/air pollution due to wind erosion. Air monitoring will be used to verify that the limits specified in 585 and 586 are not exceeded.
Location				
Archeological and Historic Preservation Act	16 USC 470	This will be applicable if unexpected cultural artifacts are uncovered during excavation/farming operations.	Relevant and Appropriate	The areas at WAG 9 that will be remediated are less than 50 year old man made ditches and ponds and have not been identified as having cultural significance. If cultural artifacts are encountered, DOE will stop work and conduct a detailed survey of the area.
To Be Considered				
Environmental Protection, Safety, and Health Protection Standards	DOE Order 440.1	DOE Orders for protecting workers.	To Be Considered	Worker compliance with Standard Operating Procedures specified in the DOE Order-based Environmental Safety and Health manual ensures safe remediation activities.
Radioactive Waste Management	DOE Order 5820.2A and 435.1 in FY 2000	DOE Orders provide guidance on disposal of low-level radioactive waste.	To Be Considered	Worker compliance with Standard Operating Procedures specified in the DOE Order-based Environmental Safety and Health manual and the Waste Handling manual ensures safe packaging and disposal of low-level radioactive waste.
Radiation Protection of the Public and Environment	DOE Order 231.1	DOE Orders that provide guidance on radiological environmental protection and guidelines on cleanup of residual radioactive material prior to release of the property.	To Be Considered	Worker compliance with Standard Operating Procedures specified in the DOE Order-based Environmental Safety and Health manual ensures protection of the public and enviornment from radiological hazards.

Table 9-2. Evaluation of ARARs and TBC compliance for the contingent remedy - excavation and On-INEEL disposal of contaminated soils.

ARAR Statute	Citation	Reason	Relevancy	Attained by
Action				
Idaho Fugitive Dust Emissions	IDAPA 16.01.01.650	To control dust during excavation operations.	Applicable	Application of water and/or chemical dust suppressants to land disturbed by excavation/trucking operations.
General Requirements for Shippers	49 CFR 173	DOE will have to comply with the requirements for packaging and transporting of radioactive and hazardous material to on-INEEL disposal site.	Applicable	These packaging and transportation regulations will be met by placing the waste in appropriate shipping containers and applying the appropriate placards.
Chemical				
NESHAPS-Radionuclides other than Radon-222 and Radon-220 at DOE facilities-Emission Standard	40 CFR 61.92	Limits the exposure of radioactive contaminant release to 10 mrem/year for the off-site receptors.	Applicable	Monitors for airborne radionuclides are currently installed around the ANL-W facility and can be supplemented with additional monitors if necessary. Dust control measures will limit the release of radioactive contaminants.
Rules for the Control of Air Pollution in Idaho	IDAPA 16.01.01.585 and 586	Idaho rules governing the release and verification of carcinogenic and noncarcinogenic contaminants into the air.	Applicable	The excavation and truction operations will use water and chemical suppressants to limit the release of dust. Revegetation of the disturbed areas will be completed after the excavations. Air monitoring will be used to verify that the limits specified in sections 585 and 586 are not exceeded.

Table 9-2 (Continued).

ARAR Statute	Citation	Reason	Relevancy	Attained by
Location				
Archeological and Historic Preservation Act	16 USC 470	This will be applicable if unexpected cultural artifacts are uncovered during excavation operations.	Relevant and Appropriate	The areas at WAG 9 that will be remediated are less than 50 years old man made ditches and ponds and have not been identified as having cultural significance. If cultural artifacts are encountered, DOE will stop work and conduct a detailed survey of the area.
To Be Considered				
Environmental Protection, Safety, and Health Protection Standards	DOE Order 440.1	DOE Orders for protecting workers.	To Be Considered	Worker compliance with Standard Operating Procedures specified in the DOE Order-based Environmental Safety and Health manual ensures safe remediation activities.
Radioactive Waste Management	DOE Order 5820.2A and 435.1 in FY 2000	DOE Orders provide guidance on disposal of low-level radioactive waste.	To Be Considered	Worker compliance with Standard Operating Procedures specified in the DOE Order-based Environmental Safety and Health manual and the Waste Handling manual ensures safe packaging and disposal of low-level radioactive waste.
Radiation Protection of the Public and Environment	DOE Order 231.1	DOE Orders that provide guidance on radiological environmental protection and guidelines on cleanup of residual radioactive material prior to release of the property.	To Be Considered	Worker compliance with Standard Operating Procedures specified in the DOE Order-based Environmental Safety and Health manual ensures protection of the public and enviornment from radiological hazards.

9-2. Table 9-2 lists each the ARAR statutes, specific citation reference, reason why the ARAR is retained, relevancy, and how DOE will attain compliance with the ARAR. In addition to including the ARARs in Table 9-2, the TBCs are also included. For the ANL-W facility, the TBCs consist of DOE Orders which prescribe minimum standards for work practices at DOE facilities. These DOE Orders are TBCs and are used in the absence of applicable state or federal regulations. As shown in Table 9-2, all of the ARARs and TBCs for the contingent remedy of excavation and On-INEEL disposal can be met.

Other Federal and State laws are not included as ARARs for WAG 9 but may be invoked for the on-INEEL disposal site operator. The operator of the disposal site will have to comply with these action-specific laws: IDAPA 16.01.05.008 (40 CFR 264) -"Standards for Owners and Operators of Hazardous Waste Treatment, Storage and Disposal facilities" and IDAPA 16.01.05.011 (40 CFR 268)-"Land Disposal Restrictions". One chemical-specific law, IDAPA 16.01.11.200-Idaho Groundwater Quality Rule" has not been included as an ARAR but may become applicable to the contingent remedy if future groundwater concentrations exceed those levels that were predicted by the OU 9-04 Comprehensive RI/FS. Currently ANL-W does not exceed any of these regulated groundwater concentrations and does not expect to exceed them based on modeling results. However, DOE will continue with groundwater monitoring in accordance with the ANL-W Environmental Monitoring Program.

9.3 Cost Effectiveness

The selected remedial action of phytoremediation for the ANL-W sites of concern is cost effective because it is anticipated that its costs will be the lowest of those alternatives that met the RAOs. The costs for phytoremediation will depend on the actual uptake percentages for the radionuclide and inorganic contaminants that are being determined during the bench-scale testing. The contingent remedy of excavation with on-INEEL disposal offers the second lowest costs for meeting the RAOs. The costs for the excavation with on-INEEL disposal costs are well defined since the packaging and transportation of hazardous and low level radioactive wastes are routine operations.

Table 9-3 summarizes the estimated costs in net present value for all of the alternatives that were retained for detailed analysis. These costs were estimated assuming an annual inflation rate of 5%. The selected remedy of phytoremediation is the most cost effective remedial alternative for all eight areas with the exception of the Industrial Waste Pond. The contingent remedy of excavation and on-INEEL disposal is the next lowest cost alternative. The variations in costs between the phytoremediation and the excavation and on-INEEL disposal depended on the depth of contamination and surface area of the remedial sites. Compared to excavation and disposal, the costs of phytoremediation are lower for sites that have relatively large surface areas and which have contamination at relatively shallow depths (i.e., 0.5 to 4 feet). Due to cost savings which can be realized on overhead and equipment costs when one cleanup technique is applied to all WAG 9 sites, phytoremediation was selected for all WAG 9 sites. Costs for the bench-scale greenhouse testing have not been included into the phytoremediation alternatives for each site. These bench-scale greenhouse costs are relatively small (less than $200,000) and are being incurred prior to the signing of the ROD and as such are considered pre-ROD costs.

9.4 Utilization of Permanent Solutions and Alternative Treatment Technologies to the Maximum Extent Possible

The selected remedy will result in the permanent removal of contaminants from the soil and will concentrate the wastes, minimizing the volume of waste to be disposed. The phytoremediation is designed to work on sites that contain radionuclide and/or inorganically contaminated wastes. Tests on the effectiveness of phytoremediation to extract the radionuclides and/or inorganics from the ANL-W soils are currently being performed. The outcome of these tests will determine the implementability of phytoremediation prior to the start of the 1999 growing season. The contingent remedy of excavation and on-INEEL disposal offers a permanent solution to the removal of the radionuclide and/or inorganic wastes from ANL-W in a non-concentrated form. Both the selected and the contingent remedies offer permanent solutions since both alternatives will remove the contaminants from the ANL-W site.

Table 9-3. Net present value of capital, operating and maintenance (O&M) and total cost for remedial alternatives at OU 9-04 sites.

Alternative	Technology	Capital Costs	Operations and Maintenance Costs	Total Cost
Alternative 3a	Engineered Cover with Institutional Controls	$6,625,000.00	$954,000.00	$7,580,000.00
Alternative 4a	Excavation and Disposal at the On-INEEL Proposed INEEL Soils Repository	$5,340,000.00	$535,000.00	$5,876,000.00
Alternative 4a	Excavation and Disposal at the On-INEEL RWMC Facility	$5,575,000.00	$535,000.00	$6,110,000.00
Alternative 4b	Excavation and Disposal at a Private Off-INEEL Facility	$12,591,000.00	$535,000.00	$13,126,000.00
Alternative 5	Phytoremediation with Off-INEEL Disposal of Plant Matter/Ash	$2,289,000.00	$535,000.00	$2,824,000.00

9.5 Preference for Treatment as a Principal Element

The selected remedial remedy of phytoremediation, satisfies the criterion for treatment of the contaminated media. The phytoremediation is an innovative treatment technology that appears to be the most appropriate remedy for cleanup of both radionuclide- and inorganically-contaminated soils at WAG 9. CERCLA grants preferential treatment to technologies that treat soils to reduce principal wastes. Field tests will be conducted to verify the perfomance of phytoremediation on the ANL-W soils. The contingent remedy, excavation with on-INEEL disposal, does not include treatment, but does provide a proven conventional technology to meet the established RGs for each of the eight areas at WAG 9.

10 DOCUMENTATION OF SIGNIFICANT CHANGES

CERCLA Section 117(b) requires that an explanation of any significant changes from the preferred alternative originally presented in the Proposed Plan be provided in the ROD.

Cost estimates for Alternatives 4a excavation and disposal at the RWMC have since been prepared. These costs are similar in magnitude to those of the Alternative 4a for the proposed INEEL Soils Repository. Costs are slightly higher because of the increase in travel costs associated with the longer transportation distance. The overall project costs for Alternative 4a using the proposed INEEL Soils Repository or the RWMC facility are considered to be essentially the same. Thus, if the selected alternative does not work, and the contingent alternative is implemented, the final selection of which disposal option in Alternative 4a will be made during the remedial design phase.

One area, the Ditch C portion of ANL-01 was identified as having inorganic contaminants that posed unacceptable risks to the ecological receptors in the Proposed Plan. This area has now been eliminated as an area requiring remediation. In preparation of the Screening Level Ecological Risk Assessment (SLERA) the maximum contaminant concentrations were used to calculate the HQ for the ecological receptors. These HQs were determined by using the maximum contaminant concentration at these two sites. New HQs have been calculated for all WAG 9 sites using the 95% UCL concentrations reported in Appendix A of the OU 9-04 Comprehensive RI/FS. Under CERCLA the calculation of the contaminant concentration is based on a reasonable maximum exposure (RME). The 95% UCL concentration is more reasonable than using the maximum concentration when the number of samples in the data set is greater than 10. The result of using the 95% UCL concentration verses the maximum concentration reduced the ecological receptors HQs at these two sites to acceptable levels. Thus, the Ditch C portion of ANL-01 will no longer require remedial action because the 95% UCL inorganic concentrations are below the remediation goal concentrations. The remaining six areas identified in the Proposed Plan as having inorganics that posed unacceptable risks to the ecological receptors, have had similar refinements in the calculation of the HQs using 95% UCL values verses the maximum concentrations. These remaining six areas are; Industrial Waste Pond (ANL-01), Ditch A (ANL-01), Ditch B (ANL-01), Main Cooling Tower Blowdown Ditch (ANL-01A), Sewage Lagoons (ANL-04), and the Industrial Waste Liftstation Discharge Ditch (ANL-35). All of these six areas still have at least one inorganic contaminant at concentrations above the RGs and are still retained for remedial action.

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11 RESPONSIVENESS SUMMARY

The Responsiveness Summary is designed to provide the agencies with information about community preferences regarding the selected remedial alternatives and general concerns about the site. Secondly, it summarizes how public comments were evaluated and integrated into the decision-making process and records how the agencies responded to each of the comments. Appendix A provides a summary of community involvement in the CERCLA process for OU 9-04 and a summary of comments received and corresponding agency responses.

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Appendix A

Responsiveness Summary

Appendix A

Responsiveness Summary

Table of Contents

APPENDIX A

RESPONSIVENESS SUMMARY

A Summary of Comments Received

During the Public Comment Period

A-1. OVERVIEW

Operable Unit (OU) 9-04 is within Waste Area Group (WAG) 9 at the Argonne National Laboratory - West (ANL-W) at the Idaho National Engineering and Environmental Laboratory (INEEL). WAG 9 contains 37 identified release sites contained within four operable units. DOE added 2 sites from WAG 10 to the 37 release sites evaluated in the OU 9-04 Comprehensive RI/FS. Eight subareas from five of these 39 sites were determined to have contamination that posed a potential risk to human health and the environment. For those sites that will require remedial action to reduce or eliminate those risks, the remedial action alternatives were evaluated and a preferred alternative was selected. In addition to the eight areas of concern at OU 9-04, there were 33 areas that were determined to pose no unacceptable risk to human health or the environment and were identified by the agencies as requiring No Action. A Proposed Plan that summarized the results of the RI/FS and presented the preferred remedial alternative and the contingent alternative was released by the agencies for public review on January 8, 1998. Public comment on this document started on January 12, 1998, and was extended until March 12, 1998 due to a request from the public. Public meetings were held in Boise, Moscow, and Idaho Falls, Idaho, on January 20, 21, and 22, 1998, respectively.

This Responsiveness Summary responds to both written and verbal comments received during the public comment period and meetings. Generally, support for the preferred alternative was favorable with some commentors expressing concern over mobility of contaminants and the introduction of non-native plant species to remove the contaminants from soils.

A-2. BACKGROUND ON COMMUNITY INVOLVEMENT

In accordance with Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) Sections 113(k)(2)(B)(I-v) and 117, a series of opportunities were made available for public information and participation in the remedial investigation and decision process for OU 9-04, WAG 9 of the ANL-W from 1991 to the present. Public outreach activities included distribution of fact sheets that briefly discussed the status of investigations to date, *INEEL Reporter* articles and updates, a Proposed Plan, and focus group interactions, including tele-conference calls, briefings, presentations, and public meetings.

On January 8, 1998, the U.S. Department of Energy, (DOE) issued a news release to more than 100 media contacts concerning the beginning of a 30-day public comment period pertaining to the WAG 9 ANL-W Proposed Plan, which began January 12, 1998, and was extended to March 12, 1998. In addition, an *INEEL Reporter* article was sent to approximately 6,700 people on the INEEL Community Relations Plan mailing list and mentioned the public meeting schedule. Both the news release and *INEEL Reporter* gave notice to the public that WAG 9 ANL-W investigation documents would be available before the beginning of the comment period in the Administrative Record section of the INEEL Information Repositories located in the INEEL Technical Library, the INEEL Boise Office, and public libraries in Fort Hall, Pocatello, and Moscow, Idaho. Following the announcement of the public comment period, 6,700 copies of the Proposed Plan were mailed to the public for their review and comment. In addition, public meetings were held at Boise, Moscow, and Idaho Falls, Idaho, on January 20, 21, and 22, 1998, respectively. Written comment forms were available at the meetings, and a court recorder was present at each meeting to record transcripts of discussions and public comments. A total of about 75 people not associated with the project attended the public meetings. Overall, 9 citizens provided formal comments; of these, 1 citizen provided verbal comments and eight provided written comments. Comments were also received from the INEEL Citizens Advisory Board and are included in this responsiveness summary.

This Responsiveness Summary has been prepared as a part of the Record of Decision (ROD). All formal verbal comments, as given at the public meetings, and all written comments, as submitted, are included in the Administrative Record for the ROD. Table A-1 is provided as a reference and lists the commentors in alphabetical order, identifies the comment and response number, and identifies the page the comment and response can be found. The ROD presents the selected alternative and contingent alternative for the eight areas in OU 9-04 that are of concern and recommends No Action for the remaining 33 areas. The selected alternative was chosen in accordance with CERCLA, as amended by the Superfund Amendments and Reauthorization Act, and to the extent practicable, the National Oil and Hazardous Substances Pollution Contingency Plan (the National Contingency Plan). In addition, the selected alternative fully complies with CERCLA §121 statutory preference for treatment of contaminants for as a permanent solution. The decisions presented in the ROD are based on information contained in the Administrative Record.

A-3. LISTING OF COMMENTERS, COMMENT NUMBERS, AND PAGE NUMBERS

All of the formal comments submitted by the public in either written or verbal form were tabulated and assigned a comment number. Where applicable the commentors are listed alphabetically in the first column, the comment number appears in the second column, and the page the comment and response can be found on is shown in the third column.

NAME	AFFILIATION	COMMENT #	APPENDIX A PAGE #
CAB	Citizen Advisory Board	40	17
CAB	Citizen Advisory Board	41	17
CAB	Citizen Advisory Board	42	18
CAB	Citizen Advisory Board	43	18
CAB	Citizen Advisory Board	44	18
CAB	Citizen Advisory Board	45	19
Beatrice Brailsford	Snake River Alliance	57	22
Beatrice Brailsford	Snake River Alliance	58	22

NAME	AFFILIATION	COMMENT #	APPENDIX A PAGE #
Beatrice Brailsford	Snake River Alliance	59	22
Beatrice Brailsford	Snake River Alliance	60	23
Beatrice Brailsford	Snake River Alliance	61	23
Beatrice Brailsford	Snake River Alliance	62	23
Beatrice Brailsford	Snake River Alliance	63	23
Beatrice Brailsford	Snake River Alliance	64	24
Beatrice Brailsford	Snake River Alliance	65	24
Beatrice Brailsford	Snake River Alliance	66	24
Chuck Broscious	Environmental Defense Institute	4	6
Chuck Broscious	Environmental Defense Institute	5	7
Chuck Broscious	Environmental Defense Institute	6	7
Chuck Broscious	Environmental Defense Institute	7	8
Chuck Broscious	Environmental Defense Institute	8	8
Chuck Broscious	Environmental Defense Institute	9	10
Chuck Broscious	Environmental Defense Institute	10	10
Chuck Broscious	Environmental Defense Institute	11	10
Chuck Broscious	Environmental Defense Institute	12	10
Chuck Broscious	Environmental Defense Institute	13	10
Chuck Broscious	Environmental Defense Institute	14	11
Chuck Broscious	Environmental Defense Institute	15	11
Chuck Broscious	Environmental Defense Institute	16	11
Chuck Broscious	Environmental Defense Institute	17	12
Chuck Broscious	Environmental Defense Institute	18	12
Chuck Broscious	Environmental Defense Institute	47	5
Dennis Donnelly	Concerned Citizen	19	12
Dennis Donnelly	Concerned Citizen	20	12
Dennis Donnelly	Concerned Citizen	21	12
Dennis Donnelly	Concerned Citizen	22	13

NAME	AFFILIATION	COMMENT #	APPENDIX A PAGE #
Dennis Donnelly	Concerned Citizen	23	13
Dennis Donnelly	Concerned Citizen	24	13
Dennis Donnelly	Concerned Citizen	25	14
Walt Hampson	Concerned Citizen	27	14
Walt Hampson	Concerned Citizen	28	14
Walt Hampson	Concerned Citizen	29	14
Walt Hampson	Concerned Citizen	30	15
Walt Hampson	Concerned Citizen	31	15
Martin Huebner	Coalition 21	34	16
Martin Huebner	Coalition 21	35	16
Martin Huebner	Coalition 21	36	16
Darwin Jeppesen	Concerned Citizen	37	16
Darwin Jeppesen	Concerned Citizen	38	16
Darwin Jeppesen	Concerned Citizen	39	17
KayLin Loveland	Envirocare of Utah Inc.	48	19
KayLin Loveland	Envirocare of Utah Inc.	49	20
KayLin Loveland	Envirocare of Utah Inc.	50	20
KayLin Loveland	Envirocare of Utah Inc.	51	21
KayLin Loveland	Envirocare of Utah Inc.	52	21
KayLin Loveland	Envirocare of Utah Inc.	53	21
KayLin Loveland	Envirocare of Utah Inc.	54	21
KayLin Loveland	Envirocare of Utah Inc.	55	22
KayLin Loveland	Envirocare of Utah Inc.	56	22
Swen Magnuson #1	Concerned Citizen	1	5
Swen Magnuson #1	Concerned Citizen	2	6
Swen Magnuson #1	Concerned Citizen	3	6
Swen Magnuson #2	Concerned Citizen	26	14
Unknown #1	Unknown	32	15

NAME	AFFILIATION	COMMENT #	APPENDIX A PAGE #
Unknown #1	Unknown	33	15
Unknown #2	Unknown	46	19

A-4. SUMMARY OF COMMENTS WITH RESPONSES

Comments and questions raised during the public comment period on the Proposed Plan for the WAG 9, OU 9-04 Comprehensive RI/FS for ANL-W are summarized below. The public meetings were divided into a brief presentation, an informal question-and-answer session, and a formal public comment session. The meeting format was described in published announcements, and meeting attendees were reminded of the format at the beginning of the meeting. The informal question-and-answer session was designed to provide immediate responses to the public's questions and concerns. Several questions were answered during the informal period of the public meetings on the Proposed Plan. This Responsiveness Summary does not attempt to summarize or respond to issues and concerns raised during the informal part of the public meetings. However, the Administrative Record contains complete transcripts of these meetings, which include the agencies' responses to these informal questions.

Comments received during the formal comment session of the meetings are addressed by the agencies in this Responsiveness Summary. The public was requested to provide their comments in writing, verbally during the public meetings, or by recording a message using INEEL's toll-free number.

Comment 1 I am concerned that DOE-ID appears to be using the engineered barrier or rock cover that was emplaced at the SL1 burial grounds and at the BORAX facility as the prototype barrier for any subsequent proposed disposal facilities on the INEEL. This SL1-style rock cover or "barrier" is part of the containment alternative presented in the proposed plans for both WAG 8 and WAG 9. It is well documented that the effect of this rock cover would be to increase infiltration and minimize evaporation thereby increasing the amount of water available to leach contaminants from the disposed soil the cover is supposed to protect. I have read the proposed plan for WAG 8 and pertinent portions of the WAG 8 Comprehensive RI/FS and see no acknowledgment that this rock cover will increase infiltration. The fact that this rock cover will increase infiltration and leaching should be plainly stated in the proposed plan for the information of members of the public. If anything, the wrong impression is given in the Overall Protection of Human Health and the Environment section of the proposed plan for WAG 8 (page 16) where it is stated that Alternative 3 will "minimize infiltration". This last statement is miserably incorrect and needs to be changed.

Response If the "engineered cover" had been selected as the remedial alternative, it would have been designed to limit the infiltration of water over the containment area with the use of multiple layers of different materials. The "engineered cover" depicted in the WAG 9 Proposed Plan was only a sketch giving an idea of the relationship between the contaminated soil and a generic multi layer rock cover. The "engineered cover" is not the selected alternative nor is it the contingent alternative for WAG 9 because other alternatives offered greater benefit at reduced cost. Because of the nature and location of the radiologically contaminated soils at the Naval Reactors Facility (WAG 8), the engineered cover has been selected as the preferred alternative for WAG 8. WAG 8 engineers are currently evaluating the use and effectiveness of various media that could be potentially used in their multilayered engineered cover.

Comment 2 While the groundwater pathway may not have been a risk in the baseline risk assessment for either WAGs 8 or 9, even with infiltration rates as high as 1 m/yr, it still seems wrong from an environmental stewardship viewpoint to needlessly install a rock cover that will undoubtedly increase leaching from the contaminated soil and increase concentrations of leached contaminants in the Snake River Plain aquifer. I feel this statement is true even if the increased infiltration caused by the rock cover only incrementally increases contaminant concentration in the aquifer because there are better cover alternatives. True engineered barriers that provide the necessary shielding and biotic protection have been designed and are being tested on the INEEL. These barriers are resistant to erosion and minimize infiltration. These barrier designs should be given a thorough comparative evaluation to an SL1-style barrier for use in the selected alternative. This comparison should include analysis of even incremental risk increases in the groundwater pathway from increased infiltration due to the rock cover. Hopefully, this comparison will occur since there are words in the Comprehensive RI/FS for WAG 8 that the proposed rock cover in Alternative 3b is a "conceptual design" and that the final design will be developed during the remedial design process.

Response The "engineered cover" as depicted on page 15 of the WAG 9 proposed plan is only a conceptual figure. If an engineered barrier were selected as the remedy, it would be disgned to reduce infiltration, resist erosion, and prevent biotic intrusion. Decisions as to the use of an impermeable layer will be made during the remedial design phase of this CERCLA process.

Comment 3 The WAG 8 Comprehensive RI/FS cites Reith and Caldwell (1990) as stating the proposed barrier is appropriate for containment in an arid area. I have read the article by Reith and Caldwell, and, although the article admits that several of these rock covers have been built at UMTRA sites, the main point presented in the article is that since vegetated soil covers are more effective for reducing infiltration and subsequent leaching from contaminated soils rather than simple rock covers. This gives the appearance that the Reith and Caldwell article is incorrectly cited out of context for purposes of justifying the choice of engineered barriers.

Response Vegetated soil covers were not selected because some plants indigenous to the INEEL have very deep tap roots that could penetrate the soil cover. This could lead to inadvertent uptake by these plants and possible exposure to other ecological receptors. The "native soil cover" is not the preferred alternative nor is it the contingent alternative for WAG 9 because other alternatives offered benefit gains at reduced costs.

Comment 4 This must not be called a "comprehensive" plan because it does not include ANL-W's underground high-level waste site (Radioactive Scrap and Waste Facility) which as of

1981 has 81 cubic meters of waste containing 9,823,000 curies of radioactive materials including 40.73 grams of plutonium [ID-100.54-81@19] DOE must not continue to postpone treatment and disposition of this waste.

Response The OU 9-04 comprehensive RI/FS included an evaluation of all active, operating facilities which are co-located near the 37 WAG 9 inactive waste sites that are being investigated under CERCLA. Any release sites discovered in the future will be evaluated as new sites for remediation under the provisions of the FFA/CO. The Radioactive Scrap and Waste Facility (RSWF), is one such facility. The RSWF is a dry-type spent nuclear fuel and radioactive waste storage facility. The spent fuel and waste is stored in double lined steel containers that are inserted into cathodically protected steel cylinders which are set vertically into the ground. All RSWF spent fuel and waste is retrievable and DOE plans to treat these materials prior to disposal in an appropriate off-site disposal facility. The RSWF is currently operating under a Resource Conservation and Recovery Act (RCRA) storage permit for hazardous and radioactive mixed wastes. Closure of the RSWF will be governed by RCRA closure requirements.

Comment 5 ANL-W intends to continue to use the contaminated Industrial Waste Pond (ANL-01) and the sewage Lagoons (ANL-04) and the State and EPA regulators are silent. Continued waste water discharge perpetuates the leaching of contaminates into the soil column and eventually to the aquifer below.

Response The fate of all contaminants at WAG 9 inactive waste sites have been modeled using a very conservative modeling program (GWSCREEN). This program takes into account the soil types, depth to the aquifer (630 ft), and continued water discharges to these sites. The results of this conservative modeling show that continued use of the Industrial Waste Pond and Sewage Lagoons does not pose an unacceptable risk to human health or the environment. Core samples collected in drainage ditches as well as the Industrial Waste Pond verify that the contaminants have not migrated greater than 3.5 feet below the surface after 37 years of operation. The planned continued use of these facilities for approximately the next 5 and 35 years, respectively, is also not likely to drive these contaminants down to the aquifer at levels that pose unacceptable risk to human health and the environment. The contaminants will be remediated down to the cleanup goals after the useful life of the Industrial Waste Pond and Sewage Lagoons, approximately 5 and 35 years, respectively.

Comment 6 The Plan acknowledges that: "Human health risks from cesium-137 will be at acceptable levels within 130 years due to radiological decay." [Plan@14] Yet in the next paragraph, the plan states: "Institutional controls are assumed to remain in effect for at least 100 years." What about the next 30 years. Once the CERCLA process is wound up in a few years, there are uncertainties that DOE or any other federal agency is going to fulfill its questionably enforceable commitment to provide monitoring and institutional control to ensure no people gain access to the waste sites. Again, a trust fund is warranted and a requirement under the NRC 10 CRF ss 61.63 "Financial Assurances for Institutional Controls."

Response It is true that the cesium-137 contamination would radioactively decay to acceptable levels in 130 years if no action were taken at the WAG 9 site. The 100 years of institutional controls proposed in Alternative 3, is based on the most likely future use of the INEEL which is the continued control the land by DOE. . Alternative 3, includes an engineered cover that is designed to last longer than the 130 years necessary to limit the direct radiation exposure pathway to future residents.

Comment 7 ANL-W's Plan, like the NRF deficient Plan, is to consolidate all the contaminated soil into the Industrial Waste Pit, and again, it does not meet Applicable or Relevant and Appropriate Requirements (ARAR's). This lack of full disclosure by the polluter and the regulators is unacceptable. The drawing offered in the Plan [plan@15] of the Industrial Pit does not vaguely resemble the 20 foot deep localized depression that the pit is in. The Plan drawing shows a flat terrain with the leach pit being the only depression. This is a major discrepancy. Continued pooling of surrounding precipitation over the pit (covered or not) will provide water to leach contaminates towards the aquifer. Moreover, the cap does not include an impermeable seal to keep precipitation out. The Waste Pit currently receives drainage from a considerable area to the southeast in addition to storm water from the ANL-W site. A major flaw in the Plan is not providing drainage diversion away from the pit regardless of the alternative chosen. The fact that chromium, mercury, selenium, and zinc are in the pit sediments compels DOE to do Toxicity Characteristic Leaching Procedure (TCLP) to determine if it qualifies the waste as a mixed hazardous/radioactive waste and it must be then disposed pursuant to RCRA land disposal restrictions (40 CFR-148). DOE's preferred remedial alternative simply is not supported by essential information.

Response None of the alternatives evaluated for WAG 9 include consolidating contaminated soils in an Industrial Waste Pit. The containment alternative (Alternative 3) would consolidate the WAG 9 contaminated soils in an engineered landfill located at a well-drained location near ANL-W. If the contingent Alternative 4a (use of an INEEL Soils Repository, or RWMC) is selected, the soils would be consolidated several miles away from WAG 9 under an engineered cover that would prohibit the pooling of surface water or precipitation. The "engineered cover" as depicted on page 15 of the WAG 9 proposed plan is only a conceptual figure. Decisions as to the use of an impermeable layer will be made during the remedial design phase of this CERCLA process. Contaminant modeling has shown that continued use of the ANL-W Industrial Waste Pond as a drainage collection area does not pose an unacceptable risk to humans or the environment.

Samples have been collected and analyzed for total and TCLP analysis in the waste sites with the highest concentrations of arsenic, chromium, mercury and lead. All of these samples had concentrations less than the TCLP limits and therefore, do not have the potential to leach to groundwater at concentrations high enough to pose a risk. None of the WAG 9 soils have the potential to fail the TCLP test for selenium.

Comment 8 The plan states at page 8 that: "contaminantes to the groundwater show only arsenic and chromium exceeded the cleanup goal screening levels." The ANL-W RI/FS well (M-13)

1993 sample data shows strontium-90 at 1,330 pCi/L. [RI/FS, Vol III App.H pg.3]. EPA maximum concentration level for strontium-90 in drinking water is 8 pCi/L. Sampling in 1994-95 shows well M-12 contains organic chemicals hundreds of times over the MCL [RI/FS, Vol v]. The Plan does not acknowledge this strontium migration or propose remedies that will correct the problem. This contaminate migration exemplifies the disastrous impact of leach pits and why the ANL-W Industrial Pond must be immediately closed and appropriately cleaned up.

Response The Proposed Plan actually states that "the modeling of contaminants to the groundwater shows that only arsenic and chromium exceeded the cleanup goal screening levels. Therefore, the maximum concentrations of the arsenic and chromium at 100 years in the future were used to determine the risks to human health." The cleanup goal screening levels provided a tool to screen contaminants from inclusion into the risk assessment because of the contaminants low concentrations and or mass.

The organic contaminant detected at well M-12 is bis(2-Ethylhexyl)phthalate and was detected numerous times in the sampling of the upgradient as well as the downgradient wells at WAG 9. This is a common laboratory contaminant and as such the EPA recognizes that samples can be qualified as un-detectable if the concentration is less then 10 times the concentration in the blank sample. The bis(2-Ethylhexyl)phthalate was screened as a contaminant of concern for the following reasons; (1) because the highest concentration of bis(2-Ethylhexyl)phthalate was detected in the upgradient well (M-12), (2) no data trends exist of increasing concentrations, and (3) EPA recognizes it is a common laboratory contaminant.

It is correct that strontium-90 had an estimated detection of 1,330 pCi/L from the ANL-W downgradient monitoring well M-13 for the sample collected October 25, 1995. However, the sample collected the same day for the upgradient monitoring well M-12 also had an estimated detection of strontium-90 of 1,320 pCi/L. The data from this October 25, 1995 sampling has been qualified as estimated (J) by the data validator because the laboratory control samples (LCS) were outside control limits. Because the data was flagged by the data validator, at thousands of times above the detection levels, DOE believes that laboratory error was the cause of these erroneously high values.

Also, data results collected on July 31, 1995 showed 0.7 and 0.1 pCi/L from M-12 and M-13, respectively. These well are located 4,928.83 feet apart with M-13 almost directly downgradient of M-12. The groundwater in the Snake River Plain Aquifer flows at most 10 feet per day and thus it would take 492 days for the water under M-12 to reach M-13. If this were the case the strontium-90 would have to have been detected in the upgradient M-12 well for over a year and this is not the case since the July 31, 1995 data shows both the M-12 and M-13 strontium-90 results at 0.7 and 0.1 pCi/L. In an effort to substantiate the strontium-90 detections in the M-12 and M-13 wells, two groundwater samples from each well were collected on December 14, 1995. The upgradient M-12 samples were both non-detects at 0.4 and 0.0 pCi/L, while the downgradient M-13 well had one non-detect at 0.5 and one detection at 1.6 pCi/L. Also, results of drinking water wells EBR-II # 1 and 2 have been analyzed semi-annually for gross beta with the results being lower than the MCL level of 8 pCi/L.

Comment 9 Alternative 5 (phytoremediation) that would use plants, over five growing seasons, to absorb the contaminants in the leach pit, is so ludicrous in an arid environment that it does not deserve rebuttal.

Response Phytoremediation is a technology that has proven successful at other DOE radiologically contaminated waste sites and has been selected as the preferred alternative to remediate soils in feight areas at ANL-W. Because WAG 9 is located in a semi-arid environment, the contaminant extracting plants would be irrigated as required to enhance plant growth. The EBR-II Leach Pit was remediated in 1993 and is not part of this proposed action.

Comment 10 There are issues of plant density to prevent wind erosion (contaminate dispersion).

Response Four of the eight areas where the Agencies propose using phytoremediation are ditch bottoms and ponds. Based on the physical nature of these depressed sites, they tend to accumulate windblown sediments. The one site (ANL-09-Mound) is on the banks of a large storm water Interceptor Canal and currently has only sparse vegetation growing. Any additional vegetation that is growing during the dry season will only help prevent against windblown contamination. The contaminant extracting plants would be densely planted to ensure effective root penetration into contaminated soils.

Comment 11 What is ANL going to do after annual harvest and between growing seasons to prevent wind erosion?

Response After each of the growing seasons are completed, DOE may continue to keep the area wetted until the ground freezes. This would prevent any windblown contamination problems. Other erosion control options may include use of a biodegradable soil tackifier that would be sprayed on after each harvest.

Comment 12 Bench scale tests in ANL's greenhouse will only reflect efficiencies in an artificial climate controlled environment, not the real desert thing.

Response Every effort is being taken during the greenhouse studies to simulate actual conditions at the INEEL. These include temperature control, humidity control, and sunlight duration.

Comment 13 The Sanitary Waste Lift Station (ANL-31) is listed as a no action site presumably because ANL wants to continue to use the pumps. The Plan offers no data to substantiate this no action decision.

Response As stated in the Operable Unit 9-04 Comprehensive RI/FS, the ANL-31 building consists of two lift stations in the same building. The South side contains a sanitary sewage waste lift station and will remain in service. The North side of ANL-31 contained the industrial lift station that was used to pump wastes to the EBR-II Leach Pit. This side of ANL-31 was remediated in 1995 when ANL-W collected samples, removed the sludge, collected verification samples and backfilled this half of the building with clean sand. Also, all of the associated piping and contaminated soil below the piping from the industrial lift station to the EBR-II Leach Pit was removed and disposed of at RWMC in 1995 and 1996. In their current conditions, neither of the two lift stations in the ANL-31 site poses an unacceptable risk to human health or the environment.

Comment 14 The Track 2 Investigation shows maximum concentrations of sludge collected from the Lift Station as follows: cesium-137 at 9,380 pCi/g, strontium-90 at 2,470 pCi/g, uranium at 4.8 pCi/g, neptunium-237 at 13 pCi/g, and cobalt-60 at 16.3 pCi/g. [Vol. III track 2 App. -H pg4] This contamination suggests that this Lift Station was inappropriately excluded from the cleanup. May 1995 Track 2 reflect continued high gross alpha and gross beta in the pump water and sludge. [Vol. III Appendix - E]

Response The Track 2 investigation resulted in the removal action that is described in the response to comment 13. The lift station no longer poses an unacceptable risk to human health or the environment.

Comment 15 The EBR-II Leach Pit (ANL-08) underwent an interim "cleanup" action in 1993 when only "the majority of the sludge was removed" and the pit was backfilled. The Plan fails to acknowledge that the remaining sludge had the following pCi/g concentrations: cesium-137 at 29,110, iodine-129 at 124, neptunium-237 at 329, strontium-90 at 2,247, yttrium-90 at 2,247. [RI/FS Vol. II pg. 59-60] Inadequate interim actions end up being permanent because of the additional volume of contaminated soil used as backfill is now part of the problem.

Response Every effort was taken during the 1993 removal action to remove as much of the sludge as possible. These actions included pressure washing of the irregular basalt floor and collection of the material that was removed during the washing. The residual sludge remaining was estimated to be at most one-eighth of and inch thick. a worst case estimate of the sludge volume (using a one-eighth-inch thickness) was used in modeling the transport of contaminants to the aquifer. These values were used in the OU 9-04 Comprehensive RI/FS along with the modeling of contaminants that may have leached from the sludge in the years prior to the 1993 removal action. The modeling of past and future contaminant behavior shows that the EBR-II Leach Pit no longer poses an unacceptable risk to human health or the environment.

Comment 16 The public has demanded for many years that DOE treat its radioactive waste into a stable vitrified form so that it can be stored onsite until a safe permanent repository can be established.

Response Vitrification was evaluated as a potential alternative in Chapter 7 of the OU 9-04 Comprehensive RI/FS and screened out because of it is typically used for long lived radionuclide wastes. Contaminants at WAG 9 are short lived radionuclides and do not require isolation for 10,000 years. In addition the high cost of vitrification is not justifiable for use on the short lived radionuclide wastes and offer very little gained benefits over the selected and contingent remedies.

Comment 17 At the very legal minimum, all contaminated soil should be shipped off the INEEL site to a licensed and permitted RCRA hazardous/radioactive disposal site.

Response None of the wastes at the WAG 9 sites have failed the TCLP test for RCRA wastes. The off-INEEL disposal (Alternative 4b) was not selected because of the cost effectiveness. The preferred and contingent alternatives at ANL-W are protective of human health and the environment, and comply with Applicable and Relevant and Appropriate Requirements, including the requirements of the Resource Conservation and Recovery Act.

Comment 18 a compromise would be if there is an area on the INEEL site that is not over the Snake River Plain Aquifer, use it to build a licensed and permitted RCRA hazardous/radioactive disposal site for INEEL low-level wastes only.

Response None of the wastes at the WAG 9 sites have failed the TCLP test for RCRA wastes. The Agencies have proposed Alternative 5, phytoremediation as the preferred alternative. This alternative would treat the soils to remove the contaminants. The contaminants would then be recovered, stabilized, and disposed of in accordance with the Waste Acceptance Criteria of a licensed off-site disposal facility.

Comment 19 I feel the goal of your contamination cleanup should be the unrestricted future use of the land and water resources at the site.

Response The Agencies agree that the goal of the cleanup at WAG 9 should be the unrestricted future use of the land and water resources at ANL-W. By selecting Alternative 5, phytoremediation, as the preferred alternative to remediate the eight areas of WAG 9 that pose unacceptable risks to human health and the environment, the Agencies will be able to release the lands without any restriction after the remediation goals are met.

Comment 20 To attain unrestricted future use of the land and water resources at the site, I feel the plan should address the removal of spent fuel from all the reactors.

Response OU 9-04 Comprehensive RI/FS investigated the 37 inactive waste sites at ANL-W, and two inactive waste sites from WAG 10 near ANL-W that have had past releases to the environment, and active ANL-W facilities were reviewed for future releases. The active facilities are currently operating under stringent operating procedures and permits. When the operating facilities are shut-down they will be defueled and decontaminated and left in a radiologically and industrially safe condition. Four of five reactors at ANL-W have been shutdown and have been defueled. The remaining small neutron radiography reactor is still operating and will be defueled when DOE terminates its operation.

Comment 21 What about the sodium from the Experimental Breeder Reactor II, all of it— what will be its fate? The plan should remove of all the sodium coolant and materials contaminated with radioactive sodium. I feel the sodium is especially important due to the environmental mobility of sodium and the location of this site over the aquifer that supplies most of the water for this region.

Response As part of the DOE's shutdown plan for the Experimental Breeder Reactor-II, the primary and secondary sodium coolant will be drained and chemically converted to non hazardous sodium carbonate. DOE has constructed a facility at ANL-W to convert all EBR-II sodium and sodium potassium alloy to sodium carbonate powder, a non-hazardous compound that has very low levels of radioactivity.

Comment 22 When I visited the Argonne-West site over fifteen years ago, I remember seeing, on the northeast side of the complex, a series of waste-holes that appeared to be vertical pipes with concrete lids that were said to contain intermediate-level radioactive wastes which were contaminated with sodium. I see no mention of these structures in your description of the site— Have they been removed?

Response The Radioactive Scrap and Waste Facility (RSWF), is a dry-type spent nuclear fuel and radioactive waste storage facility. The spent fuel and waste is stored in double lined steel containers that are inserted into cathodically protected steel cylinders which are set vertically into the ground. All RSWF spent fuel and waste is retrievable and DOE plans to treat these materials prior to disposal in an appropriate off-site disposal facility. The RSWF is currently operating under a Resource Conservation and Recovery Act (RCRA) storage permit for hazardous and radioactive mixed wastes. Closure of the RSWF will be governed by RCRA closure requirements.

Comment 23 I also remember the Hot Fuel Examination Facility, and how really hot the cells were inside. Your contamination cleanup should address this contamination, as well as all other fission or activation products onsite.

Response OU 9-04 Comprehensive RI/FS investigated the 37 inactive waste sites at ANL-W, two inactive waste sites from WAG 10 near ANL-W, and active ANL-W facilities The active facilities, such as the Hot Fuel Examination Facility, are currently operating under stringent operating procedures and permits. When the operating facilities are eventually shut-down they will be defueled and decontaminated and left in a radiologically and industrially safe condition. At that time residual risks to human health and/or the environment will be evaluated under the CERCLA process with appropriate remedies undertaken as necessary.

Comment 24 This plan's general approach of covering existing waste with a couple feet of dirt and rock and leaving it there is unacceptable.

Response If an engineered cover were implemented it would be designed to prevent the infiltration of water and exposure to humans and ecological receptors. However, the preferred alternative for remediation of the eight areas that pose unacceptable risks to human health and the environment is phytoremediation. The applicability of phytoremediation to remove the contaminants from the soil is currently being evaluated using bench-scale greenhouse tests. If phytoremediation does not work satisfactorily, a contingent alternative of off-site containment and disposal in a soils repository has been selected.

Comment 25 I feel your program should address and plan to truly cleanup the big problems at the site, as well as the little ones. My fear is that if you do not, no one ever will.

Response The goal of the CERCLA activities at WAG 9 is to eliminate unacceptable risks to human health and the environment. OU 9-04 Comprehensive RI/FS investigated the 37 inactive waste sites at ANL-W, two inactive waste sites from WAG 10 near ANL-W, and also addressed active ANL-W facilities. The active facilities are currently operating under stringent operating procedures and permits. When the operating facilities are shut-down they will be defueled and decontaminated and left in a radiologically and industrially safe condition.

Comment 26 I commend the agencies for selecting an innovative and relatively inexpensive approach to remediate a facility that is environmentally clean compared to other facilities in the INEEL and especially compared to other facilities in the DOE-complex.

Response The agencies acknowledge the commentor's statement that the preferred Alternative 5, phytoremediation is the best and most cost effective alternative option.

Comment 27 Analyses seem conservative and thorough. I favor Alternative 3, considering cost and expeditious improvement over the present state.

Response Although Alternative 3, capping in-place would offer expeditious implementation, it's costs are considerably higher than other alternatives that treat the soils. Thus, the preferred Alternative is 5 and the contingent Alternative is 4a.

Comment 28 Phytoremediation may be scientifically interesting with some long range potential. So pursue that on the parallel path - a small scale development and proof-tests.

Response ANL-W has started bench-scale greenhouse tests to determine the applicability on ANL-W soils. If the bench-scale greenhouse test results are a success a two-year field season will be implemented with verification samples collected to determine how well it is working in the field. If phytoremediation is unsuccessful at either the bench-scale tests or two-year field season, the contingent Alternative 4a would be implemented. The costs associated with parallel implementation of phytoremediation with other alternatives would be prohibitive.

Comment 29 Let's not delay progress on known methods of improvement for years permitting proof of new ideas.

Response The extra costs of using the excavation and disposal over the phytoremediation alternative is not warranted by the benefits gained. Institutional controls practices that are currently in-place are preventing exposures to current occupational workers at ANL-W. Phytoremediation has proven successful at other DOE contaminated sites for remediating radionuclide and metal contaminated soils. However, ANL-W, with it's specific set of contaminants and location in a semi-arid climate; coupled with the agencies desire to use native plants as much as possible, mandates that the evaluation process be conducted for however long it takes to grow, harvest, and analyze the plants to determine contaminant uptake factors, both in the greenhouse study and at ANL-W. The results of the sampling show that after nearly 40 years of operation, the contaminants are relatively shallow (0-2 feet) and the continued facility continued operation will not leach the contaminants to deeper depths. Thus, there appears to be no determent in allowing phytoremediation to be implemented over the expected time frame.

Comment 30 To say that phytoremediation is "site specific" is probably an understatement qualifying its practicality for general use?

Response Phytoremediation is very contaminant and site specific. That is why the Agencies have selected a contingent alternative if phytoremediation does not work satisfactorily during the bench-scale tests and the two-year field season.

Comment 31 I would hasten to add "more power to new/better ideas - innovation etc"; let's just prove them out before large scale application where sure results are needed.

Response ANL-W has started bench-scale greenhouse tests to determine the applicability on ANL-W soils. If the bench-scale greenhouse test results are a success a two-year field season will be implemented with verification samples collected to determine how well it is working in the field. If phytoremediation is unsuccessful at either the bench-scale tests or two-year field season the contingent Alternative 4a (consolidation at a soils repository) will be selected.

Comment 32 I feel the damage is done! We keep moving this contaminated material around.

Response The OU 9-04 Comprehensive RI/FS determined that only eight areas pose unacceptable risks to human health and the environment. Phytoremediation has been selected by the Agencies as the preferred alternative to remediate these areas. Phytoremediation extracts the contaminants from the soil, thus eliminating the need to move the contaminated soil around. The plants used in phytoremediation will be incinerated (volume reduction) and the ash solidified prior to shipment to an approved landfill.

Comment 33 We just keep piling the contaminated soil on the INEEL so it can filtrate through the soils to the groundwater or be released to the atmosphere.

Response The preferred Alternative 5, phytoremediation, will use plants to uptake contaminants into the plant tissues. This will eliminate the chance that they can filtrate in the soil or be spread to the atmosphere.

Comment 34 The Coalition 21 wishes to commend the DOE and the ANL for considering the phytoremediation technology. The Coalition concurs, contingent on the success of on-going and future studies of this technology, that this should be the preferred method.

Response The Agencies acknowledge the commentor's statement that the preferred Alternative 5, phytoremediation, is the best and most cost effective alternative option.

Comment 35 Care should be taken that if non-native plants are used in the proposed phytoremediation, that such exotic species be absolutely prevented from escaping into the Idaho environment.

Response If non-native plants to the INEEL are selected for phytoremediation, DOE will take every precaution to prevent their propagation. These precautions will, at a minimum include harvesting the plants prior to flowering, and may also include spraying a herbicide to form a sterile zone around the sites to be remediated, and harvesting the whole plant (above and below ground).

Comment 36 Also, the methods for disposing of the ash residues that contains the materials removed from the ANL-West site per this Waste Plan should be specified and evaluated to ensure that the methods meet all applicable criteria.

Response The ash residue after incineration will meet the acceptance criteria of an appropriate radioactive waste disposal facility, or a RCRA permitted hazardous waste disposal facility. The actual method for preparation of the ash for disposal will depend on the standard operating procedures for the operation of the incinerator used.

Comment 37 My comment is that I noticed that there was no mention of a soil type or series in your report.

Response That is correct, the Proposed Plan did not mention the soil type or series. The Proposed Plan is only a short 28 page summary of the 2,600 page OU 9-04 Comprehensive RI/FS. Section 2.5 of the OU 9-04 Comprehensive RI/FS discusses the soils type and series.

Comment 38 Being a BLM Soil Scientist, I maybe able to assist you in identifying the national soil series located adjacent to your Argon clean up site. If your soil is what I think may be there, The Natural Resource Conservation Service and I have a complete characterization lab analysis of this soil on the INEEL.

Response The Agencies would appreciate any help in confirming the specific soil series of the sites where phytoremediation would be implemented. Figure 2-4 of the OU 9-04 Comprehensive RI/FS shows the general soils types near ANL-W. This figure shows that WAG 9 is located in a transition zone between two soil types (432-Malm-Bondfarm-Matheson complex, and 425-Bondfarm-Rock outcrop-Grassy Butte complex).

Comment 39 Gale Olson, Randy Lee with Lockheed and I have published soil information on the site in: "The Status of Soil Mapping for the Idaho National Engineering Laboratory," Jan. 1995 through the Lockheed Company. (INEL-95/0051) Soil series at Argonne are believed to be different than those found in the Bonneville and Jefferson County USDA soils survey reports.

Response DOE used the Gale Olson, Randy Lee document to complete Section 2.5 Soils type for the OU 9-04 Comprehensive RI/FS. Figure 2-4 was taken from this report.

Comment 40 The INEEL CAB recommends selection of Alternative 5, phytoremediation, as the preferred alternative for achieving remedial objectives at ANL-W. As described in the Proposed Plan, Phytoremediation is an innovative technology that utilizes plants to uptake toxic metals and radionuclides through roots *in situ*. Plants that have been used successfully in the past include grasses, shrubs, and/or trees. Following uptake the plant vegetation would be harvested, sampled, and incinerated for volume reduction. The resultant ash would be sampled and sent to a permitted disposal facility. Alternative 5 was ranked best in 6 out of the 7 evaluation criteria, and the cost is significantly lower than the other alternatives. We will be pleased if the technology proves successful. We will support continued endeavors to pursue innovative technologies that could enhance INEEL's role as an environmental laboratory and that could be marketed for use at other contaminated sites

Response The agencies acknowledge the INEEL Citizens Advisory Board's support for Alternative 5, phytoremediation, as the best and most cost effective alternative option for WAG 9 contaminated sites.

Comment 41 We are concerned about the potential for spread of any non-native INEEL species that may be used in the remediation. We recommend that the Record of Decision (ROD) provide more detailed explanations of the species to be used and how DOE proposes to control their potential spread.

Response If non-native plants to the INEEL are selected for phytoremediation, DOE will take every precaution to prevent their propagation. These precautions will, at a minimum include harvesting the plants before flowering, and may also include spraying a herbicide to form a sterile zone around the sites to be remediated, and harvesting the whole plant (above and below ground). The ROD includes selection of the alternatives. The actual selection of the plants would follow successful completion of the bench-scale greenhouse testing. This documentation of the selected plant species as well as planting and harvesting practices will be documented in the Remedial Design Work Plan.

Comment 42 In addition, we are concerned that contaminants taken up into vegetation could be consumed by animals using the remediation area for habitat and feeding. We recommend the ROD address this concern and provide an explanation of steps that will be taken to limit ecological risks to wildlife populations.

Response Some of the plants being investigated in the bench-scale greenhouse test are weedy plants that animals and insects do not eat. The actual selection of the plants would follow successful completion of the bench-scale greenhouse testing. A thorough description of the selected plant species, as well as planting, harvesting, and animal fencing practices will be documented in the Remedial Design Work Plan.

Comment 43 We are finally concerned about dioxins resulting from incineration. We recommend that the combustion of secondary wastes should be addressed in the ROD.

Response Recently, more information has become available on the production of dioxins through incomplete burning of wet and damp vegetation and wood in the presence of high chloride/chlorine concentrations. The plants that DOE is proposing to use have low levels of chloride/chlorine and they will also be completely dried prior to bailing and submittal to the incinerator. Standard Operating Procedures used at the incinerator will prevent incomplete oxidation during the incineration of the plant matter. The off-site rule requires the use of a RCRA subtitle C incinerator or testing of the off-gas. Secondary waste from the burning of dried phytoremediation plant matter would not be of concern since plant matter will have to meet the operating incinerator acceptance criteria. Meeting the incinerator's acceptance criteria will ensure that emissions remain under limits described in the incinerator's air quality permit.

Comment 44 With regard to the contingency identified in the preferred alternative (i.e. Alternative 4A, which would include excavation and disposal on-site at the Soils Repository proposed for Waste Area Group 3 - Idaho Chemical Processing Plant), we have some concern regarding the identification of a facility that may or may not be constructed. We understand that the Radioactive Waste Management Complex (RWMC) may be licensed at some time to receive wastes generated through implementation of cleanup activities in compliance with the Comprehensive Environmental Response, Compensation, and Liability Act. If so, the ROD should explicitly name the RWMC as a back-up to Alternative 4 and document that it would perform similarly to the Soils Repository according to the evaluation criteria.

We understand that the costs associated with the use of RWMC would be comparable to the Soils Repository. The ROD should provide more complete disclosure of the costs associated with the contingency and its backup to support comparisons between them.

Response The language in the Proposed Plan was intended to describe the use of either the Proposed INEEL Soils Repository or the RWMC as a contingent remedial alternative. These two possible locations are identified as Alternative 4a (excavation and disposal on the INEEL) in the OU 9-04 Comprehensive RI/FS. The final selection would be completed in the Remedial Design phase of the CERCLA process, because of the unknowns associated with the proposed INEEL Soils Repository. Costs for both the RWMC and proposed INEEL Soils Repository will be included in the ROD.

Comment 45 Finally, we urge the rapid determination of the feasibility of phytoremediation so that it or the contingency plan can be implemented expeditiously. We request that DOE report the results of the bench scale tests to the INEEL CAB once available.

Response DOE will release the results of the phytoremediation bench-scale tests in August/September 1998, to the CAB as well as other INEEL WAG managers as soon as they are available.

Comment 46 Agree that alternative 5 is best/cost effective option.

Response The Agencies acknowledge the commentor's statement that the preferred alternative is the best and most cost effective alternative option.

Comment 47 DOE's continued use of Envirocare in Utah is unacceptable because it is not a permitted and licenced RCRA/NRC Subtitle C hazardous/radioactive dump. Envirocare is currently being sued by the Natural Resources Defense Council for RCRA non-compliance.

Response The use of Alternative 4b, excavation and disposal off-INEEL was not retained as the preferred or the contingent alternative for the WAG 9 soils that require remediation. Therefore, no WAG 9 CERCLA wastes would be sent to the Envirocare facility for disposal.

Comment 48 The remediation time is lengthy. At least five growing seasons will be required for the remediation to be implemented. This obviously prolongs the risk to human health and the environment for at least four years longer than Alternative 4, Excavation and Disposal, which is the next preferred option and could easily be accomplished commercially in one construction season.

Response Although Alternative 4, would offer expeditious implementation, it's costs are considerably higher than Alternative 5 and no benefits would be gained because current institutional controls at ANL-W limit the occupational worker exposures to acceptable levels. The only risk to humans is from the exposure of cesium-137. These sites are outside the work area of ANL-W that is enclosed with a security fence. Well over 95% of the workers at ANL-W work exclusively within the security fenced area. If work is ever performed in these areas, institutional controls will be implemented to reduce the worker exposure to the levels that pose acceptable risks.

In addition, under CERCLA, permanent solutions and alternative treatment technologies or resource recovery technologies, to the maximum extent practicable, are given preference. Alternative 5 offers cost effective treatment while Alternative 4 does not. Thus, Alternative 5 has been selected for use at WAG 9.

Comment 49 If phytoremediation does not work after the five growing seasons, an alternative remedy will have to be implemented, costing additional time and money and extending the safety and health risks. Additionally, Alternate 4b could be implemented for the same approximate cost and completed in a much shorter time .

Response Phytoremediation will undergo two series of tests with stringent go, no-go, criteria prior to full utilization at WAG 9. The first is a bench-scale greenhouse test conducted on ANL-W soils and based on these results the second full scale two-year field test will be implemented or the contingent alternative will be selected. At the end of the two-year field test, samples will be collected of the soil and the plants to determine if Alternative 5 is still practicable for use or if the contingent alternative should be implemented. The long-term benefits gained by being able to remove the contaminants from the soils justify the costs of conducting the bench-scale greenhouse test and the two-year field season. Institutional controls are in-place to reduce the occupational worker exposures to acceptable levels during the implementation of the phytoremediation tests.

Comment 50 Phytoremediation is a complicated, multi-step process including five separate planting and harvesting campaigns, incineration of each harvest and consequent disposal of all ash generated from plant burns. In comparison, excavation and disposal is a quick and proven technology that will insure that all remediation goals are met.

Response The long-term benefits gained by being able to remove the contaminants from the soils justify the costs of conducting the bench-scale greenhouse test and the two-year field season. These sites are outside the work area of ANL-W that is enclosed with a security fence. Well over 95% of the workers at ANL-W work exclusively within the security fenced area. Thus, institutional controls are in-place to reduce the occupational worker exposures to acceptable levels during the implementation of the phytoremediation tests.

Comment 51 Although fugitive dust and toxic substances may be reduced while plant life is growing in the contaminated area, five harvesting cycles create five invasive situations where dust will present contamination problems and expose workers, rather than a one time remediation.

Response The risk driver to humans is through the direct exposure pathway of the radionuclides. Engineering controls such as the use of Personnel Protection Equipment, dust suppression, fencing, and commercially available farm equipment with climate controlled cabs can be utilized to reduce the workers exposure.

Comment 52 The government must continue to pay surveillance costs for at least five years until the contaminated area remediation is complete, thus the operations and maintenance costs should be significantly higher than Alternative 4, Excavation and Disposal.

Response DOE is proposing that Alternatives 4 and 5 would each have continued operations and maintenance (O&M) costs that would include continued groundwater, soil and air monitoring in accordance with DOE Orders for the next 20 years. The continued O&M will allow DOE to validate the contaminant modeling results in the RI/FS. Thus, no savings would be realized in O&M costs between Alternatives 4 and 5.

Comment 53 It is important to calculate increases in cost over time since this remediation is spread out over five years and Alternative 4 can be completed in one construction season. The cost of this alternative increases over time, and a realistic comparison must account for this.

Response DOE performed the present value costs for all the retained alternatives for WAG 9. The present value cost for Alternataive 5 was estimated to be less than the present value cost for Alternative 4. The present value costs take into account the inflation costs of work performed in the future as well as the time value of money interest rates. To account for these unknowns, seven years worth of growing seasons were used in preparation of the estimate, evan though it is estimated to take only five years.

Comment 54 The reasoning and facts used to discount Alternative 4b were flawed in some areas. The cost analysis exaggerated commercial excavation and disposal by approximately 240% over disposal costs that are currently available to the DOE and INEEL through existing contracts.

Response DOE used a tipping fee of $350 per cubic yard for disposal of low level radioactive contaminated soil at private facility. The tipping fee was based on costs presented by Envirocare during a soil remediation seminar in Idaho Falls in the fall of 1996. These tipping fee costs along with the $10 per cubic yard rail transport costs make this alternative much more expensive for large sites than either Alternative 4a or 5.

Comment 55 The reasoning and facts used to discount Alternative 4b were flawed in some areas. Operations and maintenance costs are listed at $535,000. Why is there a cost for this since remediation could be completed in one construction season?

Response See response to comment 52.

Comment 56 The fervor with which the preferred alternative was presented at the Idaho Falls public meeting seemed to transcend the enthusiasm for environmental remediation customarily displayed by the Department of Energy and the State of Idaho.

Response DOE, EPA, and the State support phytoremediation for use at WAG 9 because this remedy is the least invasive to the existing ecosystem, has a high probability of success, and is the least costly. In addition, this alternative meets the CERCLA preference for treatment of contaminated soils.

Comment 57 Phytoremediation is being pursued under a Cooperative Research and Development Agreement between Argonne and Applied Natural Sciences. How much federal money has and will be invested in this CRADA? What other federal resources is Applied Natural Sciences using for this project? How will any eventual profits from Treemediation be distributed?

Response This information that you are referring to came from literature of past studies of phytoremediation. DOE is pursuing phytoremediation through it's ANL-W contractor who is working with the ANL-E phytoremediation experts. All costs of the project are going to pay for labor and operations for ANL employees. ANL is a non-profit organization and is only interested in improving the technology and helping others implement it at other facilities.

Comment 58 Is research on phytoremediation going forward in the private sector unaided by the federal government? Is Argonne making use of that research?

Response Private sector use of phytoremediation is growing rapidly with major cleanup activities at non-government facilities. The private research information is being shared between companies on the applicability and success of phytoremediation. However, each of the private companies have patent pending processes and specialized plants that they are using that they will not share with others outside the company.

Comment 59 It is unclear how often harvest will occur. Will the plants be dug up only once (at the end of five growing seasons), after every growing season, after the 1999 field season (to obtain sample results)?

Response The answer to this question will be determined after the bench-scale greenhouse testing is complete. If a small annual grass plant is selected the plants would be harvested after each growing season. Likewise if a perennial plant is selected, the harvesting will occur after two year growing season.

Comment 60 Are the tests planned for the end of the 1999 field season of the contaminated soil or of the plants?

Response Successful bench-scale greenhouse tests have to be completed prior to the two-year long field season. If the bench-scale greenhouse testing is successful, both plant and soil samples will be collected after the two-year long field season and used to validate the applicability of the phytoremediation process at WAG 9. The contaminant analysis of the plants will determine percent uptake of the contaminats on a dry weight basis. These uptake rates will be used along with the density of the plants and the mass of the plant matter to determine the length of time needed to achieve the RAOs. If phytoremediation is unsuccessful at either the bench-scale greenhouse test or the two-year field season, the contingent alternative will be selected.

Comment 61 Phytoremediation seems to necessitate handling the same contaminant several times: during harvest, during sampling, during incineration, during further sampling, entrained on filters, in transport to disposal, during disposal. Are the public and worker health, environmental, and economic costs of each of those steps included in the analysis under review?

Response One of the CERCLA criteria used to evaluate the alternatives is short-term effectiveness. Short-term effectiveness addresses any adverse impacts on human health and the environment that may be posed during the implementation period and period of time needed to achieve the cleanup goals. Institutional controls will be used to reduce worker exposure during activities associated with phytoremediation including; planting, harvesting, shipping, sampling, incineration, characterization, and disposal.

Comment 62 Has Argonne undertaken a mass balance analysis yet? Even an attempt at a theoretical mass balance analysis (curies in soil vs curies disposed) would be useful.

Response DOE has performed a rough mass balance of total curies of cesium-137 in the soil and the total curies of cesium-137 that would have to be removed to meet the remediation goals for WAG 9. A total of 0.295 curies of cesium-137 is in the sites that pose unacceptable human health risks and DOE would have to remove 0.06 curies to meet the established 23.3 pCi/g cleanup goal. This is approximately 20 percent removal of the cesium-137.

Comment 63 When the plants are dug up, airborne releases of contaminants might occur. When asked about that possibility at the Boise public meeting, presenters seemed to indicate that the workers doing the digging would be protected by radiation suits. In Idaho Falls, however, there was reference instead to holding down the dust with a garden hose. The contrast between those two responses seems to indicate a lack of planning and, perhaps, a lack of respect for public concerns.

Response DOE apologizes for the inconsistencies between the meetings. The risk driver to humans is through the direct exposure pathway of the radionuclides. Engineering controls such as the use of Personnel Protection Equipment, dust suppression, fencing, and commercially available farm equipment with climate controlled cabs can be utilized to reduce the workers exposure. Final design of the correct engineering controls will be defined in the Remedial Design phase after completion of the ROD.

Comment 64 The low grade, ongoing problems at Envirocare, a commercial nuclear dump in Utah, emphasize that shipping contamination from here to there may not effect any particular environmental benefit.

Response DOE agrees that no benefit is gained by hauling the soil from WAG 9 and placing it under a cap at an off-INEEL landfill. Ultimately the soil contamination still exists and potential harm to the existing ecosystem from excavation could be significant.

Comment 65 Has INEEL investigated all possible offsite disposal options and their relative risks and benefits? Is that analysis available to the public?

Response DOE has evaluated two off-site disposal options as part of the 24 possible remedial process options evaluated in the WAG 9 RI/FS. These process options were screened using effectiveness, cost, and implementability and used to develop the WAG 9 remedial alternatives. The five WAG 9 remedial alternatives were then evaluated using the nine CERCLA evaluation criterion. The possible offsite disposal option that was retained for WAG 9 is Alternative 4b. In this alternative DOE used the Envirocare facility in Utah to develop the cost estimates. The final selection of an offsite facility would take place in the Remedial Design phase. However, Alternative 4b is not the preferred or the contingent alternative for WAG 9.

A complete review of this process can be found in Chapters 7, 8, 9, and 10 of the WAG 9 Comprehensive RI/FS.

Comment 66 When was the management and operating contract for Argonne National Laboratory last put out for competitive bid?

Response To date, the management and operating contract for Argonne National Laboratory has never been put out on a competitive bid.

Appendix B

Administrative Record

Appendix B

Administrative Record

Table of Contents

ENVIRONMENTAL RESTORATION & WASTE MANAGEMENT
ADMINISTRATIVE RECORD DOCUMENT CATEGORY LISTING
January 20, 1998

AR1.0		**SITE IDENTIFICATION**
	AR1.1	Background
	AR1.2	Notification/Site Inspection Reports
	AR1.3	Preliminary Assessment (PA) Report
	AR1.4	Site Investigation (SI) Report
	AR1.5	Previous Operable Unit Information
	AR1.6	No Action Sites
	AR1.7	Initial Assessments
AR2.0		**REMOVAL RESPONSE**
	AR2.1	Sampling and Analysis Plans (SAP)
	AR2.2	Sampling and Analysis Data/Chain of Custody Forms (COC)
	AR2.3	EE/CA Approval Memorandum
	AR2.4	EE/CA
	AR2.5	Action Memorandum
	AR2.6	Amendments to Action Memorandum
	AR2.7	Health and Safety Plan
	AR2.8	Workplan
	AR2.9	Quality Assurance Project Plan
	AR2.10	Hazard Classification
AR3.0		**REMEDIAL INVESTIGATION (RI)**
	AR3.1	Sampling and Analysis Plans (SAP)
	AR3.2	Sampling and Analysis Data/Chain of Custody Forms (COC)
	AR3.3	Work Plan
	AR3.4	RI Reports
	AR3.5	Track I Investigations
	AR3.6	Track II Investigations
	AR3.7	Interim Actions
	AR3.8	Risk Assessment
	AR3.9	Quality Assurance Project Plan
	AR3.10	Scope of Work
	AR3.11	Field Sampling
	AR3.12	RI/FS Reports
	AR3.13	Cost Analysis
	AR3.14	Track 2 Summary Report
	AR3.15	Health & Safety Plan

AR3.0 REMEDIAL INVESTIGATION (RI) (continued)

AR3.16	Contingency Plan
AR3.17	Remedial Investigation and Baseline Risk Assessment Report
AR3.18	Environmental Assessment (EA)
AR3.19	Finding of No Significant Impact (FONSI)
AR3.20	Treatability Study
AR3.21	Schedule
AR3.22	Track 2 Decision Statement
AR3.23	Track 2 Preliminary Scoping Package

AR4.0 FEASIBILITY STUDY (FS)

AR4.1	ARAR Determinations
AR4.2	FS Reports
AR4.3	Proposed Plan
AR4.4	Supplements and Revision to the Proposed Plan
AR4.5	Feasibility Study Questionnaire

AR5.0 RECORD OF DECISION (ROD)

AR5.1	ROD
AR5.2	Amendments to ROD
AR5.3	Explanation of Significant Differences
AR5.4	Record of Decision Review Comments
AR5.5	ESD ROD

AR6.0 STATE COORDINATION

AR6.1	Cooperative Agreements/SMOAs
AR6.2	State Certificate of ARARs

AR7.0 ENFORCEMENT

AR7.1	Enforcement History
AR7.2	Endangerment Assessments
AR7.3	Administrative Orders
AR7.4	Consent Decrees
AR7.5	Affidavits
AR7.6	Technical Discussions with PRPs on Response Actions

AR7.0		**ENFORCEMENT (continued)**
	AR7.9	Secretarial Policy
	AR7.7	Notice Letters and Responses
	AR7.8	Offsite Shipments
AR8.0		**HEALTH ASSESSMENTS**
	AR8.1	ATSDR Health Assessments
	AR8.2	Toxicological Profiles
	AR8.3	Hazard Classification
AR9.0		**NATURAL RESOURCE TRUSTEES**
	AR9.1	Notices Issued
	AR9.2	Findings of Fact
	AR9.3	Reports
AR10.0		**PUBLIC PARTICIPATION**
	AR10.1	Comments and Responses
	AR10.2	Community Relations Plan
	AR10.3	Public Notice(s) (Availability of the Administrative Record File, Availability of the Proposed Plan, Public Meetings)
	AR10.4	Public Meeting Transcripts
	AR10.5	Documentation of Other Public Meetings
	AR10.6	Fact Sheets and Press Releases
	AR10.7	Responsiveness Summary
	AR10.8	Late Comments
AR11.0		**TECHNICAL SOURCES AND GUIDANCE DOCUMENTS**
	AR11.1	EPA Headquarters Guidance
	AR11.2	EPA Regional Guidance
	AR11.3	State Guidance
	AR11.4	Technical Sources
	AR11.5	Evaluation of Guidance Documents
	AR11.6	Technical Memorandum
	AR11.7	Technical Evaluation
	AR11.8	Land Use Documents

AR12.0 EPA AND IDHW REVIEWS

AR12.1	EPA Comments
AR12.2	IDHW Comments
AR12.3	DOE Response To Comments
AR12.4	Extension Requests and Approvals
AR12.5	Project Management Meeting Minutes

IDAHO NATIONAL ENGINEERING LABORATORY
ADMINISTRATIVE RECORD FILE INDEX FOR NO ACTION SITES
FOR THE ARGONNE NATIONAL LABORATORY - WEST WAG 9
11/04/94

ADMINISTRATIVE RECORD VOLUME I
FILE NUMBER

AR1.6 NO ACTION SITES

- Document #: 5170
  Title: ANL-10 Dry Well between T-1 and Zppr Mound
  Author: Stewart, N. A.
  Recipient: Sekot, M.
  Date: 09/21/92

- Document #: 5173
  Title: ANL-11 Waste Retention Tank 783 (never used)
  Author: Stewart, N. A.
  Recipient: Sekot, M.
  Date: 09/21/92

- Document #: 5174
  Title: ANL-12 Suspect Waste Retention Tank by 793 (removed 1979)
  Author: Stewart, N. A.
  Recipient: Sekot, M.
  Date: 09/21/92

- Document #: 5175
  Title: ANL-14 Septic Tank and Drain Fields (2) by 753 (removed 1979)
  Author: Stewart, N. A.
  Recipient: Sekot, M.
  Date: 09/21/92

- Document #: 5176
  Title: ANL-15 Dry Well by 768
  Author: Stewart, N. A.
  Recipient: Sekot, M.
  Date: 09/21/92

- Document #: 5177
  Title: ANL-16 Dry Well by 759 (2)
  Author: Stewart, N. A.
  Recipient: Sekot, M.
  Date: 09/21/92

ADMINISTRATIVE RECORD VOLUME II
FILE NUMBER

AR1.6 NO ACTION SITES (continued)

- Document #: 5178
  Title: ANL-17 Dry Well by 720
  Author: Stewart, N. A.
  Recipient: Sekot, M.
  Date: 09/21/92

- Document #: 5179
  Title: ANL-18 Septic Tank and Drain Field by 789 (removed 1979)
  Author: Stewart, N. A.
  Recipient: Sekot, M.
  Date: 09/21/92

- Document #: 5180
  Title: ANL-20 Septic Tank and Leach Field by 703
  Author: Stewart, N. A.
  Recipient: Sekot, M.
  Date: 09/21/92

- Document #: 5181
  Title: ANL-21 TREAT Suspect Waste Tank and Leaching Field (non-radioactive)
  Author: Stewart, N. A.
  Recipient: Sekot, M.
  Date: 09/21/92

- Document #: 5182
  Title: ANL-22 TREAT Septic Tank and Leaching Field
  Author: Stewart, N. A.
  Recipient: Sekot, M.
  Date: 09/21/92

- Document #: 5183
  Title: ANL-23 TREAT Seepage Pit and Septic Tank W of 720 (filled 1980)
  Author: Stewart, N. A.
  Recipient: Sekot, M.
  Date: 09/21/92

FILE NUMBER

AR1.6 NO ACTION SITES (continued)

- Document #: 5184
  Title: ANL-24 Lab and Office Acid Neutralization Tank
  Author: Stewart, N. A.
  Recipient: Sekot, M.
  Date: 09/21/92

- Document #: 5185
  Title: ANL-25 Interior Building Coffin Neutralization Tank
  Author: Stewart, N. A.
  Recipient: Sekot, M.
  Date: 09/21/92

ADMINISTRATIVE RECORD VOLUME III

- Document #: 5186
  Title: ANL-26 Critical Systems Maintenance Degreasing Unit
  Author: Stewart, N. A.
  Recipient: Sekot, M.
  Date: 09/21/92

- Document #: 5187
  Title: ANL-27 Plant Services Degreasing Unit
  Author: Stewart, N. A.
  Recipient: Sekot, M.
  Date: 09/21/92

- Document #: 5188
  Title: ANL-32 TREAT Control Building 721 Septic Tank and Leach Field (present)
  Author: Stewart, N. A.
  Recipient: Sekot, M.
  Date: 09/21/92

- Document #: 5189
  Title: ANL-33 TREAT Control Building 721 Septic Tank and Leach Field (removed 1978)
  Author: Stewart, N. A.
  Recipient: Sekot, M.
  Date: 09/21/92

ADMINISTRATIVE RECORD VOLUME IV
FILE NUMBER

AR1.7 INITIAL ASSESSMENTS

- Document #: 5475
  Title: ANL-10, Dry Wells Between T-1 and ZPPR Mound
  Author: N/A
  Recipient: N/A
  Date: 10/08/86

- Document #: 5476
  Title: ANL-11, Waste Retention Tank 783 (Never Used)
  Author: N/A
  Recipient: N/A
  Date: 09/09/86

- Document #: 5477
  Title: ANL-12, Suspect Waste Retention Tank 783 (Removed 1979)
  Author: N/A
  Recipient: N/A
  Date: 10/14/86

- Document #: 5478
  Title: ANL-14, Suspect Tank and Drain Fields (2) by 753 (Tank Removed 1979)
  Author: N/A
  Recipient: N/A
  Date: 10/05/86

- Document #: 5479
  Title: ANL-15, Dry Well By 768
  Author: N/A
  Recipient: N/A
  Date: 09/15/86

- Document #: 5480
  Title: ANL-16, Dry Well By 759 (2)
  Author: N/A
  Recipient: N/A
  Date: 09/30/86

FILE NUMBER

AR1.7 INITIAL ASSESSMENTS (continued)

- Document #: 5481
  Title: ANL-17, Dry Well By 720
  Author: N/A
  Recipient: N/A
  Date: 10/06/86

- Document #: 5482
  Title: ANL-18, Septic Tank and Drain Field by 789 (Removed 1979)
  Author: N/A
  Recipient: N/A
  Date: 09/30/86

- Document #: 5484
  Title: ANL-20, Septic Tank and Leach Field by 793
  Author: N/A
  Recipient: N/A
  Date: 10/05/86

- Document #: 5485
  Title: ANL-21, TREAT Suspect Waste Tank and Leaching Field (Non-Radioactive)
  Author: N/A
  Recipient: N/A
  Date: 10/02/86

- Document #: 5486
  Title: ANL-22, TREAT Septic Tank and Leaching Field
  Author: N/A
  Recipient: N/A
  Date: 10/03/86

- Document #: 5487
  Title: ANL-23, TREAT Seepage Pit and Septic Tank W of 720 (Filled 1980)
  Author: N/A
  Recipient: N/A
  Date: 10/05/86

- Document #: 5488
  Title: ANL-24, Lab and Office Acid Neutralization Tank
  Author: N/A
  Recipient: N/A
  Date: 09/30/86

FILE NUMBER

AR1.7 INITIAL ASSESSMENTS (continued)

- Document #: 5489
  Title: ANL-25, Interior Building Coffin Neutralization Tank
  Author: N/A
  Recipient: N/A
  Date: 09/30/86

- Document #: 5490
  Title: ANL-26, Critical Systems Maintenance Degreasing Unit
  Author: N/A
  Recipient: N/A
  Date: 10/05/86

- Document #: 5491
  Title: ANL-27, Plant Services Degreasing Unit
  Author: N/A
  Recipient: N/A
  Date: 09/30/86

- Document #: 5496
  Title: ANL-32, TREAT Control Building 721 Septic Tank and Leach Field (Present)
  Author: N/A
  Recipient: N/A
  Date: 09/30/86

- Document #: 5497
  Title: ANL-33, TREAT Control Building 721 Septic Tank and Seepage Pit (Removed 1978)
  Author: N/A
  Recipient: N/A
  Date: 10/03/86

IDAHO NATIONAL ENGINEERING LABORATORY
ADMINISTRATIVE RECORD FILE INDEX FOR THE TRACK 1 INVESTIGATION OF
OPERABLE UNIT 9-01 ANL-W
11/18/96

ADMINISTRATIVE RECORD VOLUME I
FILE NUMBER

AR1.7 INITIAL ASSESSMENTS

▲ **Document #:** 5471
Title: ANL-04, ANL Sewage Lagoons, OU 9-01
Author: N/A
Recipient: N/A
Date: 10/15/86

▲ **Document #:** 5483
Title: ANL-19, Sludge Pit W of T-7 (Imhoff Tank) (Filled in 1979), OU 9-01
Author: N/A
Recipient: N/A
Date: 10/21/86

▲ **Document #:** 5492
Title: ANL-28, EBR-II Sump (Regeneration), OU 9-01
Author: N/A
Recipient: N/A
Date: 09/30/86

▲ **Document #:** 5493
Title: ANL-29, Industrial Waste Lift Station, OU 9-01
Author: N/A
Recipient: N/A
Date: 10/23/86

▲ **Document #:** 5494
Title: ANL-30, Sanitary Waste Lift Station, OU 9-01
Author: N/A
Recipient: N/A
Date: 10/08/86

▲ **Document #:** 5500
Title: ANL-36, TREAT Photo Processing Discharge Ditch, OU 9-01
Author: N/A
Recipient: N/A
Date: 07/21/87

FILE NUMBER

AR3.1 SAMPLING AND ANALYSIS PLAN*

- Document #: W7500-4234-NP-01, Rev. 1
  Title: Sampling and Analysis Plan for Operable Units 9-01, 9-03, and 9-04 at the Idaho National Engineering Laboratory: Track 1 Sampling, Track 2 Sampling, and RI/FS Screening Sample Collection
  Author: Lee, S.D.
  Recipient: Not specified
  Date: 11/11/94

***This document can be found in OU 9-03, Volume II**

AR3.5 TRACK I INVESTIGATION

- Document #: 5704
  Title: Track 1 Investigation of WAG 9, Site Code: ANL-19, Imhoff Tank and Sludge Pit
  Author: ANL-W
  Recipient: N/A
  Date: 04/12/94

- Document #: 5743
  Title: Track 1 Investigation of WAG 9, Site Code: ANL-28 EBR-II Sump
  Author: ANL-W
  Recipient: N/A
  Date: 07/25/94

- Document #: 5744
  Title: Track 1 Investigation of WAG 9, Site Code: ANL-30 Sanitary Waste Lift Station
  Author: ANL-W
  Recipient: N/A
  Date: 07/27/94

- Document #: 5745
  Title: Track 1 Investigation of WAG 9, Site Code: ANL-60 Knawa Butte Debris Pile
  Author: ANL-W
  Recipient: N/A
  Date: 07/25/94

ADMINISTRATIVE RECORD VOLUME II
FILE NUMBER

AR3.5 TRACK I INVESTIGATION (continued)

- **Document #:** 5758
  Title: Track 1 Investigation of WAG 9, Site Code: ANL-04 ANL Sewage Lagoons - Proceed to Track 2 or RI/FS
  Author: ANL-W
  Recipient: N/A
  Date: 07/25/94

- **Document #:** 5759
  Title: Track 1 Investigation of WAG 9, Site Code: ANL-62 Sodium Boiler Building (766) Hotwell - No Further Action
  Author: ANL-W
  Recipient: N/A
  Date: 07/28/94

- **Document #:** 5760
  Title: Track 1 Investigation of WAG 9, Site Code: ANL-63 Septic Tank 789-A - No Further Action
  Author: ANL-W
  Recipient: N/A
  Date: 07/27/94

- **Document #:** 10293
  Title: Addendum to the Previously Signed WAG 9 Track 1 ANL-W Sewage Lagoons, Site Code: ANL-04
  Author: Not specified
  Recipient: N/A
  Date: 05/23/96

- **Document #:** 10294
  Title: Addendum to the Previously Signed WAG 9 Track 1 ANL-W Industrial Lift Station, Site Code: ANL-29
  Author: Not specified
  Recipient: N/A
  Date: 05/23/96

FILE NUMBER

AR3.5 TRACK I INVESTIGATION (continued)

- **Document #:** 10295
  Title: Track 1 Investigation of WAG 9, Site Code: ANL-29 Industrial Waste Lift Station (778-A) - No Further Action
  Author: ANL-W
  Recipient: N/A
  Date: 07/25/94

- **Document #:** 10302
  Title: Track 1 Investigation of WAG 9, Site Code: ANL-36 TREAT Photo Processing Discharge Ditch - No Further Action
  Author: DOE, EPA, IDHW
  Recipient: N/A
  Date: 07/25/94

- **Document #:** 10303
  Title: Track 1 Investigation of WAG 9, Site Code: ANL-61 EBR-II Transformer Yard - No Further Action
  Author: DOE, EPA, IDHW
  Recipient: N/A
  Date: 07/27/94

IDAHO NATIONAL ENGINEERING LABORATORY
ADMINISTRATIVE RECORD FILE INDEX FOR THE TRACK 2 INVESTIGATION OF OPERABLE UNIT 9-02 ANL-W
12/03/97

ADMINISTRATIVE RECORD VOLUME I
FILE NUMBER

AR1.7 INITIAL ASSESSMENTS

- Document #: 5473
  Title: ANL-08, EBR-II Leach Pit (Radioactive), OU 9-02
  Author: N/A
  Recipient: N/A
  Date: 10/24/86

AR2.1 SAMPLING AND ANALYSIS PLANS

- Document #: W7630-0004-ES-00
  Title: Sampling and Analysis Plan - Sludge Removal and Waste Solidification -- EBR-II Leach Pit
  Author: Jannotta, D.
  Recipient: ANL-W
  Date: 09/06/93

AR2.2 SAMPLING AND ANALYSIS DATA/CHAIN OF CUSTODY FORMS (COC)

- Document #: 5277
  Title: Report For The EBR-II Leach Pit Sampling and Analysis Program and Monitoring Well Installation
  Author: Golder Associates
  Recipient: Sekot, M.
  Date: 05/18/93

ADMINISTRATIVE RECORD VOLUME II

AR2.4 EE/CA

- Document #: 5291
  Title: Engineering Evaluation/Cost Analysis Report for EBR-II Leach Pit Removal for Inclusion into the Administrative Record File
  Author: Marshall, G.C.
  Recipient: Hughes, E.J.
  Date: 06/15/93

FILE NUMBER

AR3.3 WORK PLAN

- Document #: W7630-0002-ES-00
  Title: Technical Work Plan - Sludge Removal and Waste Solidification - - EBR-II Leach Pit
  Author: Jannotta, D.
  Recipient: ANL-W
  Date: 08/23/93

AR3.7 INTERIM ACTIONS

- Document #: W7630-0007-ES-00
  Title: Spill Prevention, Control and Countermeasures Plan Sludge Removal and Waste Solidification - EBR-II Leach Pit
  Author: Jannotta, D.
  Recipient: ANL-W
  Date: 08/24/93

AR3.8 RISK ASSESSMENT

- Document #: W7630-0006-ES-00
  Title: Hazards Assessment for the EBR-II Leach Pit Sludge Removal Project at Argonne National Laboratory - West
  Author: Jenkins, S.L.
  Recipient: N/A
  Date: 08/24/93

AR3.9 QUALITY ASSURANCE PROJECT PLAN

- Document #: W7630-0005-ES-00
  Title: Quality Assurance Project Plan - Sludge Removal and Waste Solidification - EBR-II Leach Pit
  Author: Jannotta, D.
  Recipient: ANL-W
  Date: 09/06/93

FILE NUMBER

AR3.14 TRACK 2 SUMMARY REPORT

- Document #: DOE/ID-12584-162
  Title: Preliminary Scoping Track 2 Summary Report for Operable Unit 9-02: EBR-II Leach Pit, Volumes I and II
  Author: Not specified
  Recipient: Not specified
  Date: 04/11/94 (signed by Agencies on 05/23/96)

AR3.15 HEALTH AND SAFETY PLAN

- Document #: W7630-0003-ES-00
  Title: Health and Safety Plan - Sludge Removal and Waste Solidification - - EBR-II Leach Pit
  Author: Jannotta, D.
  Recipient: ANL-W
  Date: 08/16/93

AR3.16 CONTINGENCY PLAN

- Document #: W7630-0008-ES-00
  Title: Contingency Plan for the EBR-II Leach Pit Sludge Removal Project at Argonne National Laboratory - West
  Author: Jenkins, S.L.
  Recipient: N/A
  Date: 08/25/93

AR10.3 PUBLIC NOTICE

- Document #: 5336
  Title: Citizens Asked to Comment on Removal Action at Argonne National Laboratory - West (ANL-W)
  Author: INEL Community Relations
  Recipient: N/A
  Date: 07/09/93

FILE NUMBER

AR12.1 EPA COMMENTS

- Document #: 9597
  Title: Review Comments - EBR-II Leach Pit, Operable Unit 9-02 Track 2 Summary Report
  Author: Jones, E.
  Recipient: Green, L.
  Date: 01/28/94

- Document #: 5742
  Title: Review Comments - Argonne EBR-II Leach Pit, Operable Unit 9-02 Track 2 Summary Report
  Author: Jones, E.
  Recipient: Green, L.
  Date: 07/14/94

AR12.2 IDHW COMMENTS

- Document #: 10018
  Title: Review Comments - EBR-II Leach Pit, Operable Unit 9-02 Track 2 Summary Report
  Author: Rosenberger, S.
  Recipient: Green, L.
  Date: 05/05/95

AR12.4 REQUEST FOR EXTENSION

- Document #: AM/ERWM-RPO-279-92
  Title: Request to Extend the Track 2 Investigation Summary Report Submittal Date for the Experimental Breeder Reactor (EBR)-II Leach Pit, OU 9-02 at the INEL
  Author: Lyle, J.L.
  Recipient: Pierre, W.; Nygard, D.
  Date: 12/15/92

- Document #: 7551
  Title: Request to Extend Track 2 Summary Report Date for the Experimental Breeder Reactor (EBR)-II Leach Pit, OU 9-02 at the INEL
  Author: Pierre, W.
  Recipient: Lyle, J.L.
  Date: 12/31/92

FILE NUMBER

AR12.4 REQUEST FOR EXTENSION (continued)

- Document #: 6092
  Title: Approval to Extend the Track 2 Investigation Summary Report Submittal Date for the Experimental Breeder Reactor (EBR)-II Leach Pit, OU 9-02
  Author: Nygard, D.
  Recipient: Lyle, J.L.
  Date: 01/11/93

- Document #: AM/ERWM-RPO-536-93
  Title: Request For Further Extension of OU 9-02 Summary Report Target Date
  Author: Lyle, J.L.
  Recipient: Pierre, W.; Nygard, D.
  Date: 08/19/93

IDAHO NATIONAL ENGINEERING LABORATORY
ADMINISTRATIVE RECORD FILE INDEX FOR THE TRACK 2 INVESTIGATION OF OPERABLE UNIT 9-03 ANL-W
09/29/97

ADMINISTRATIVE RECORD VOLUME I
FILE NUMBER

AR1.7 INITIAL ASSESSMENTS

- **Document #:** 5472
  Title: ANL-05, ANL Open Burn Pits #1, #2, and #3, OU 9-03
  Author: N/A
  Recipient: N/A
  Date: 10/15/86

- **Document #:** 5495
  Title: ANL-31, Industrial/Sanitary Waste Lift Station (Industrial Side Not Used), OU 9-03
  Author: N/A
  Recipient: N/A
  Date: 10/22/86

- **Document #:** 5498
  Title: ANL-34, Fuel Oil Spill by Building 755, OU 9-01
  Author: N/A
  Recipient: N/A
  Date: 10/14/86

ADMINISTRATIVE RECORD VOLUME II

AR3.1 SAMPLING AND ANALYSIS PLAN

- **Document #:** W7500-4234-NP-01, Rev. 1
  Title: Sampling and Analysis Plan for Operable Units 9-01, 9-03, and 9-04 at the Idaho National Engineering Laboratory: Track 1 Sampling, Track 2 Sampling, and RI/FS Screening Sample Collection
  Author: Lee, S.D.
  Recipient: Not specified
  Date: 11/11/94

ADMINISTRATIVE RECORD VOLUME III
FILE NUMBER

AR3.14 TRACK 2 SUMMARY REPORT

- **Document #:** W7500-4244-NP-01, Vol. 1
  Title: Revised Track 2 Summary Report for Operable Unit 9-03: Open Burn Pits (1, 2, and 3) Industrial/Sanitary Waste Lift Station, and the Fuel Oil Spill by Building 755, Volume I
  Author: Not specified
  Recipient: Not specified
  Date: 05/23/96

ADMINISTRATIVE RECORD VOLUME IV

- **Document #:** W7500-4244-NP-01, Appendix B, Section II
  Title: Revised Track 2 Summary Report for Operable Unit 9-03: Open Burn Pits (1, 2, and 3), Industrial/Sanitary Waste Lift Station, and the Fuel Oil Spill by Building 755, Volume II
  Author: Not specified
  Recipient: Not specified
  Date: 05/23/96

IDAHO NATIONAL ENGINEERING LABORATORY
ADMINISTRATIVE RECORD FILE INDEX FOR THE
REMEDIAL INVESTIGATION/FEASIBILITY STUDY OF OU 9-04 ANL-W
01/09/98

ADMINISTRATIVE RECORD VOLUME I
FILE NUMBER

AR1.7 INITIAL ASSESSMENTS

- Document #: 5469
  Title: ANL-01, Industrial Waste Pond and Cooling Tower Blowdown Ditches (3), OU 9-04
  Author: N/A
  Recipient: N/A
  Date: 01/26/89

- Document #: 5470
  Title: ANL-01A, Main Cooling Tower Blowdown Ditch, OU 9-04
  Author: N/A
  Recipient: N/A
  Date: 01/26/89

- Document #: 5474
  Title: ANL-09, ANL Interceptor Canal, OU 9-04
  Author: N/A
  Recipient: N/A
  Date: 10/17/86

- Document #: 5499
  Title: ANL-35, Industrial Waste Lift Station Discharge Ditch, OU 9-04
  Author: N/A
  Recipient: N/A
  Date: 07/14/87

- Document #: 5501
  Title: ANL-53, Cooling Tower Riser Pits, OU 9-04
  Author: N/A
  Recipient: N/A
  Date: 04/01/90

FILE NUMBER

AR3.1 SAMPLING AND ANALYSIS PLAN*

- **Document #:** W7500-4234-NP-01, Rev. 1
  Title: Sampling and Analysis Plan for Operable Units 9-01, 9-03, and 9-04 at the Idaho National Engineering Laboratory: Track 1 Sampling, Track 2 Sampling, and RI/FS Screening Sample Collection
  Author Lee, S.D.
  Recipient: Not specified
  Date: 11/11/94

***This document can be found in OU 9-03, Volume II**

ADMINISTRATIVE RECORD VOLUME II

AR3.3 WORK PLAN

- **Document #:** W7500-0000-ES-03, Vol. I
  Title: Comprehensive RI/FS Final Work Plan for Waste Area Group 9
  Author: Lee, S.D.; Martin, C.J.; Rood, S.M.; VanHorn, R.L.; Hampton, N.L.
  Recipient: Not specified
  Date: 08/02/96

ADMINISTRATIVE RECORD VOLUME III

- **Document #:** W7500-0000-ES-03, Vol. II
  Title: Comprehensive RI/FS Final Work Plan for Waste Area Group 9
  Author: Lee, S.D.; Martin, C.J.; Rood, S.M.; VanHorn, R.L.; Hampton, N.L.
  Recipient: Not specified
  Date: 08/02/96

AR3.10 SCOPE OF WORK

- **Document #:** W7500-4248-ES-02, Rev. 2
  Title: Final Scope of Work for the Waste Area Group 9 Comprehensive Remedial Investigation/Feasibility Study at the Idaho National Engineering Laboratory
  Author: Lee, S.D.
  Recipient: Not specified
  Date: 11/09/95

ADMINISTRATIVE RECORD VOLUME IV
FILE NUMBER

AR3.12 RI/FS REPORTS

- **Document #:** W7500-0000-ES-02, Rev. 2
  Title: Comprehensive Remedial Investigation/Feasibility Study for Argonne National Laboratory-West Operable Unit 9-04 at the Idaho National Engineering and Environmental Laboratory (FINAL), Vol. I
  Author: Lee, S.D.; Rohe, M.J.; Rood, A.S.; Stepan, I.E.
  Recipient: Not specified
  Date: 12/01/97

ADMINISTRATIVE RECORD VOLUME V

- **Document #:** W7500-0000-ES-02, Rev. 2
  Title: Comprehensive Remedial Investigation/Feasibility Study for Argonne National Laboratory-West Operable Unit 9-04 at the Idaho National Engineering and Environmental Laboratory (FINAL), Vol. II
  Author: Lee, S.D.; Rohe, M.J.; Rood, A.S.; Stepan, I.E.
  Recipient: Not specified
  Date: 12/01/97

AR4.3 PROPOSED PLAN

- **Document #:** 10441
  Title: Proposed Plan for Waste Area Group 9 - Argonne National Laboratory-West. Idaho National Engineering and Environmental Laboratory
  Author: Lee, S.D.
  Recipient: Not specified
  Date: 01/01/98

NOTE: Sampling data can be examined at Argonne National Laboratory-West.

IDAHO NATIONAL ENGINEERING AND ENVIRONMENTAL LABORATORY
ADMINISTRATIVE RECORD FILE INDEX FOR
THE INITIAL ASSESSMENTS FOR THE ARGONNE NATIONAL LABORATORY-WEST WAG 9
08/16/93

FILE NUMBER

AR1.7 INITIAL ASSESSMENTS

- Document #: 5469
  Title: ANL-01, Industrial Waste Pond and Cooling Tower Blowdown Ditches (3), OU 9-04
  Author: N/A
  Recipient: N/A
  Date: 01/26/89

- Document #: 5470
  Title: ANL-01A, Main Cooling Tower Blowdown Ditch, OU 9-04
  Author: N/A
  Recipient: N/A
  Date: 01/26/89

- Document #: 5471
  Title: ANL-04, ANL Sewage Lagoons, OU 9-01
  Author: N/A
  Recipient: N/A
  Date: 10/15/86

- Document #: 5472
  Title: ANL-05, ANL Open Burn Pits #1, #2, and #3, OU 9-03
  Author: N/A
  Recipient: N/A
  Date: 10/15/86

- Document #: 5473
  Title: ANL-08, EBR-II Leach Pit (Radioactive), OU 9-02
  Author: N/A
  Recipient: N/A
  Date: 10/24/86

- Document #: 5474
  Title: ANL-09, ANL Interceptor Canal, OU 9-04
  Author: N/A
  Recipient: N/A
  Date: 10/17/86

FILE NUMBER

AR1.7 INITIAL ASSESSMENTS (continued)

- Document #: 5475
  Title: ANL-10, Dry Wells Between T-1 and ZPPR Mound
  Author: N/A
  Recipient: N/A
  Date: 10/08/86

- Document #: 5476
  Title: ANL-11, Waste Retention Tank 783 (Never Used)
  Author: N/A
  Recipient: N/A
  Date: 09/09/86

- Document #: 5477
  Title: ANL-12, Suspect Waste Retention Tank 783 (Removed 1979)
  Author: N/A
  Recipient: N/A
  Date: 10/14/86

- Document #: 5478
  Title: ANL-14, Suspect Tank and Drain Fields (2) by 753 (Tank Removed 1979)
  Author: N/A
  Recipient: N/A
  Date: 10/05/86

- Document #: 5479
  Title: ANL-15, Dry Well by 768
  Author: N/A
  Recipient: N/A
  Date: 09/15/86

- Document #: 5480
  Title: ANL-16, Dry Well By 759 (2)
  Author: N/A
  Recipient: N/A
  Date: 09/30/86

FILE NUMBER

AR1.7 INITIAL ASSESSMENTS (continued)

- Document #: 5481
  Title: ANL-17, Dry Well By 720
  Author: N/A
  Recipient: N/A
  Date: 10/06/86

- Document #: 5482
  Title: ANL-18, Septic Tank and Drain Field by 789 (Removed 1979)
  Author: N/A
  Recipient: N/A
  Date: 09/30/86

- Document #: 5483
  Title: ANL-19, Sludge Pit W of T-7 (Imhoff Tank) (Filled in 1979), OU 9-01
  Author: N/A
  Recipient: N/A
  Date: 10/21/86

- Document #: 5484
  Title: ANL-20, Septic Tank and Leach Field by 793
  Author: N/A
  Recipient: N/A
  Date: 10/05/86

- Document #: 5485
  Title: ANL-21, TREAT Suspect Waste Tank and Leaching Field (Non-Radioactive)
  Author: N/A
  Recipient: N/A
  Date: 10/02/86

- Document #: 5486
  Title: ANL-22, TREAT Septic Tank and Leaching Field
  Author: N/A
  Recipient: N/A
  Date: 10/03/86

FILE NUMBER

AR1.7 INITIAL ASSESSMENTS (continued)

- Document #: 5487
  Title: ANL-23, TREAT Seepage Pit and Septic Tank W of 720 (Filled 1980)
  Author: N/A
  Recipient: N/A
  Date: 10/05/86

- Document #: 5488
  Title: ANL-24, Lab and Office Acid Neutralization Tank
  Author: N/A
  Recipient: N/A
  Date: 09/30/86

- Document #: 5489
  Title: ANL-25, Interior Building Coffin Neutralization Tank
  Author: N/A
  Recipient: N/A
  Date: 09/30/86

- Document #: 5490
  Title: ANL-26, Critical Systems Maintenance Degreasing Unit
  Author: N/A
  Recipient: N/A
  Date: 10/05/86

- Document #: 5491
  Title: ANL-27, Plant Services Degreasing Unit
  Author: N/A
  Recipient: N/A
  Date: 09/30/86

- Document #: 5492
  Title: ANL-28, EBR-II Sump (Regeneration), OU 9-01
  Author: N/A
  Recipient: N/A
  Date: 09/30/86

FILE NUMBER

AR1.7 INITIAL ASSESSMENTS (continued)

- Document #: 5493
  Title: ANL-29, Industrial Waste Lift Station, OU 9-01
  Author: N/A
  Recipient: N/A
  Date: 10/23/86

- Document #: 5494
  Title: ANL-30, Sanitary Waste Lift Station, OU 9-01
  Author: N/A
  Recipient: N/A
  Date: 10/08/86

- Document #: 5495
  Title: ANL-31, Industrial/Sanitary Waste Lift Station (Industrial Side Not Used), OU 9-03
  Author: N/A
  Recipient: N/A
  Date: 10/22/86

- Document #: 5496
  Title: ANL-32, TREAT Control Building 721 Septic Tank and Leach Field (Present)
  Author: N/A
  Recipient: N/A
  Date: 09/30/86

- Document #: 5497
  Title: ANL-33, TREAT Control Building 721 Septic Tank and Seepage Pit (Removed 1978)
  Author: N/A
  Recipient: N/A
  Date: 10/03/86

- Document #: 5498
  Title: ANL-34, Fuel Oil Spill by Building 755, OU 9-01
  Author: N/A
  Recipient: N/A
  Date: 10/14/86

FILE NUMBER

AR1.7 INITIAL ASSESSMENTS (continued)

- Document #: 5499
  Title: ANL-35, Industrial Waste Lift Station Discharge Ditch, OU 9-04
  Author: N/A
  Recipient: N/A
  Date: 07/14/87

- Document #: 5500
  Title: ANL-36, TREAT Photo Processing Discharge Ditch, OU 9-01
  Author: N/A
  Recipient: N/A
  Date: 07/21/87

- Document #: 5501
  Title: ANL-53, Cooling tower Riser Pits, OU 9-04
  Author: N/A
  Recipient: N/A
  Date: 04/01/90

AR6.1 COOPERATIVE AGREEMENTS

- Document #: ERD1-070-91*
  Title: Pre-signature Implementation of the CERCLA Interagency Agreement Action Plan
  Author: EPA, Findley, C.E.
  Recipient: DOE, Solecki, J.E.
  Date: 04/19/91

- Document #: 3205*
  Title: U.S. DOE INEL Federal Facility Agreement and Consent Order
  Author: N/A
  Recipient: N/A
  Date: 07/22/91

- Document #: 2919*
  Title: INEL Action Plan For Implementation of the Federal Facility Agreement and Consent Order
  Author: N/A
  Recipient: N/A
  Date: 07/22/91

FILE NUMBER

AR6.1 COOPERATIVE AGREEMENTS (continued)

▲ Document #: 1088-06-29-120*
Title: U.S. DOE INEL Federal Facility Agreement and Consent Order
Author: N/A
Recipient: N/A
Date: 12/04/91

▲ Document #: 3298*
Title: Response to Comments on the Idaho National Engineering Laboratory Federal Facility Agreement and Consent Order
Author: N/A
Recipient: N/A
Date: 02/21/92

▲ Document #: DOE/ID-10340(92)*
Title: Response to Comments on the Idaho National Engineering Laboratory Federal Facility Agreement and Consent Order
Author: N/A
Recipient: N/A
Date: 02/21/92

AR9.1 NOTICES ISSUED

▲ Document #: AM/SES-ESD-92-256*
Title: Natural Resource Trustee Notification
Author: Pitrolo, A.A.
Recipient: Andrus, C.D.
Date: 07/07/92

▲ Document #: AM/SES-ESD-92-257*
Title: Natural Resource Trustee Notification
Author: Pitrolo, A.A.
Recipient: Polityka, C.
Date: 07/07/92

▲ Document #: AM/SES-ESD-92-258*
Title: Natural Resource Trustee Notification
Author: Pitrolo, A.A.
Recipient: Edmo, K.
Date: 07/07/92

FILE NUMBER

AR9.1 NOTICES ISSUED (continued)

- Document #: AM/SES-ESD-93-007*
  Title: Invitation to Natural Trustee Representatives to Discuss Natural Resources and Environmental Restoration at the INEL
  Author: Hinman, M.B.
  Recipient: Addressee List
  Date: 01/25/93

- Document #: AM/SES-ESD-93-097*
  Title: Agenda for Meeting of Potential Natural Resource Trustees' on March 17, 1993
  Author: Twitchell, R.L.
  Recipient: Addressee List
  Date: 03/02/93

- Document #: AM/SES-ESD-93-159*
  Title: INEL Natural Resource Trustee Meeting "Group Memory" March 17, 1993
  Author: Hinman, M.B.
  Recipient: Addressee List
  Date: 03/30/93

- Document #: AM/SES-ESD-93-162*
  Title: Department of Energy Idaho Field Office (DOE-ID) Proposal for Consultation and Coordination between Natural Resource Trustees
  Author: Hinman, M.B.
  Recipient: Addressee List
  Date: 04/02/93

- Document #: AM/SES-ESD-93-276*
  Title: Department of Energy Idaho Field Office (DOE-ID) Action Item Report to Potential Natural Resource Trustees
  Author: Hinman, M.B.
  Recipient: Addressee List
  Date: 06/16/93

- Document #: 5337*
  Title: Natural Resource Trustee Representation Designation
  Author: Andrus, C.D., Governor
  Recipient: Pitrolo, A.A.
  Date: 08/11/92

FILE NUMBER

AR9.1 NOTICES ISSUED (continued)

- ▲ Document #: 5338*
  Title: Response to Natural Resource Notification
  Author: Polityka. C.S.
  Recipient: Pitrolo, A.A.
  Date: 08/28/92

AR11.1 EPA GUIDANCE

- ▲ Document #: 5163, Revision 3*
  Title: Administrative Record List of Guidance Documents
  Author: EPA
  Recipient: N/A
  Date: 08/12/92

- * **Document filed in INEL Federal Facility Agreement and Consent Order (FFA/CO) Administrative Record Binder**